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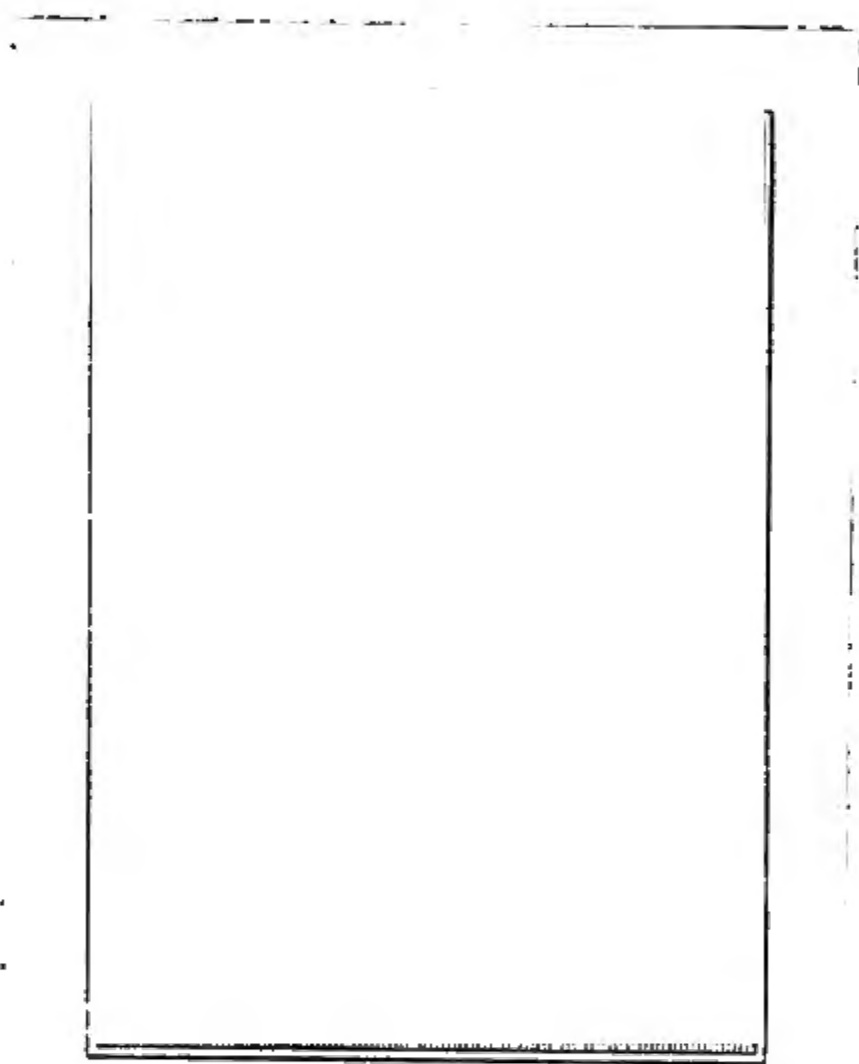
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JAN 29 1921
NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

THIRTY-THIRD ANNUAL REPORT
OF THE
DEAN AND DIRECTOR
1920

STATE OF NEW YORK

Thirty-third Annual Report

of the

New York State College of Agriculture
at Cornell University

and of the

Agricultural Experiment Station

Established under the Direction
of Cornell University
Ithaca, New York

1920

CORNELIUS BETTEN,
Vice Dean of Resident Instruction

A. R. MANN, Dean and Director

W. H. CHANDLER,
Vice Director of Research

M. C. BURRITT, Vice Director of Extension

Transmitted to the Legislature January 15, 1921

Albany
J. B. Lyon Company, Printers
1921

THIRTY-THIRD ANNUAL REPORT

OF THE

New York State College of Agriculture at Cornell
University and of the Agricultural Experiment
Station Established under the Direction
of Cornell University

STATE OF NEW YORK

DEPARTMENT OF AGRICULTURE

ALBANY, January 15, 1921

To the Honorable the Legislature of the State of New York:

In accordance with the provisions of the Statutes relating thereto, I have the honor to transmit herewith the Thirty-third Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Twenty-eighth Annual Report of the Commissioner of Agriculture.

GEORGE E. HOGUE,

Commissioner of Agriculture.

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† By affiliation with the New York Agricultural Experiment Station at Geneva.

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ACTING PRESIDENT'S LETTER OF TRANSMITTAL

June 30, 1920

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Agriculture,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing Agricultural College Experiment Stations in connection with the Land Grant Colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

And the Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said University shall expend such moneys and use such property of the State in administering said College of Agriculture as above provided, and shall report to the Commissioner of Agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said College of Agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith on behalf of Cornell University the report for the year 1919-20 of the New York State College of Agriculture, signed by the Dean of that College, Albert R. Mann.

Dean Mann's report is so detailed and so complete that it seems unnecessary for me to do more than transmit it to you, as I hereby do.

Respectfully submitted,

ALBERT W. SMITH,
Acting President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1919-20

June 30, 1920

To the Acting President of the University:

Sir: I have the honor to submit herewith a report of the work of the New York State College of Agriculture for the academic year 1919-20.

The legislative program

The problem that demanded major attention during the year just closing was the necessity for relief for the College in the way of more adequate compensation of teachers, freedom from the stifling effects of the minutely segregated appropriation act which the State has employed during recent years, and provision for housing the work of the College more nearly in accordance with its requirements. All of these matters have been discussed at length in previous reports of the Dean of the College, and I am happy to be able to record at this time substantial progress in them all.

On November 30, 1918, the Dean presented to the Agricultural College Council a detailed report of the needs of the College for additional buildings, reviewing the requirements of each department in turn, and recommended that steps be taken to prepare a plan for the enlargement of the college plant in accordance with the expressed needs of the departments. Specifically it was proposed that the Council should appoint a committee of three of its members to cooperate with the President and the Dean in investigating the building requirements of the College; to visit, as might be needful, other agricultural colleges in order to study types of buildings for particular purposes; to prepare for the consideration of the Trustees a statement and description of the buildings that should be provided; to request the Committee on Buildings and Grounds to prepare a plan for the location of the buildings; to invite the State Architect to prepare preliminary plans as a basis for requesting state appropriations; and to devise ways and means for presenting the needs to the Legislature, looking toward the adoption of the entire plan by the Legislature with a view to obtaining early authorization to begin construction on several buildings and consecutive provision for the remaining needs. In this report confidence was expressed that "we shall have the earnest support of farmers of the State in presenting our needs to the Legislature." The Council approved the proposal that a plan of enlargement be developed. It did not appoint the committee requested, but instructed the Dean to make the studies and prepare tentative plans for definite consideration by the Council.

It is of interest to record here also that the Chairmen of the Joint Legislative Budget Committees subsequently requested the Dean, in February of 1919, to prepare a comprehensive plan for the further development of the College for their consideration at the 1920 session of the Legislature.

Acting on these commissions, active steps were taken to make an exhaustive study of the building requirements. The departments of the College were requested to consider their needs with great thoroughness. This they were glad to do, and their careful work provided the basis on which all subsequent plans were developed.

It soon became apparent that in considering the future demands to be made on the College it was highly desirable, if, indeed, not imperative, to learn what the progressive farmers and others interested in the rural affairs of the State wanted the College to do and to become, so that the final decisions might combine the best judgments of the staff and of the persons who are naturally most concerned in the work and the facilities of the institution. Accordingly, and after consultation with several of the most active farm leaders in the State, it was determined to invite a large number of farmers to come to the College, in groups, at their own expense, to study in detail the work and the needs of the several departments. The persons to be invited were nominated by the heads of several of the larger farmers' organizations, editors of agricultural papers, members of the college staff, and others. The names were assorted so as to bring together in a single group, or committee, persons especially interested in the work of a particular department. In all, twenty-four groups, or committees, including a few more than three hundred persons, were invited to come at various times during the months of October and November of 1919. Nearly half of those invited found it possible to come.

The committees, on their arrival, were asked to make a thorough study of the work of the departments to which they were assigned, including a review of the courses of instruction, the experimental and research work, and the extension activities, as well as buildings and facilities, and to offer suggestions for improvements. Each committee was asked to make a written report with recommendations, which was done. The combined reports constitute a very valuable and unique body of suggestions for the development of the institution.

Because of the time required — one or two days — to study the work of a department, each committee could study but a single department. In order that the final recommendations might be considered from the standpoint of the College as a whole, each departmental committee was asked to designate two of its members to return to a joint conference on

December 5. The interest of farmers in the undertaking is nowhere better revealed than by the fact that the meeting on December 5 was attended by an almost complete representation of delegates, these men and women again coming at their own expense.

The committees of farmers were not asked to consider the question of salaries of teachers, although this had become by far the most serious and acute problem affecting the College. Their studies, however, soon revealed losses, actual and threatened, from the staff, and many of the departmental committees called attention to the urgent necessity that a new and higher salary scale be established.

The meeting on December 5, after a full day of deliberation, adopted the following recommendations:

1. That the building program as outlined in the Summary of Recommendations herewith attached and made a part of this report, be approved and adopted as the program to be presented to the Legislature. (This program enumerates the buildings required, estimated to cost at present prices more than \$5,000,000.)

2. That the Legislature be asked to appropriate in 1920 the sum of \$2,000,000 to start three large buildings in the following order: Plant Industry, Rural Engineering, Dairy Industry; and that any part of this appropriation not needed for the above-named buildings should be available for other buildings most urgently needed.

3. That the Legislature during the session of 1920 be asked to authorize the drawing of plans to cover the remainder of the program as recommended, and that the Legislature be asked in 1921 to appropriate funds to start all other buildings provided for in the committee recommendations.

4. That the "budget system" be changed so that, while the proposed expenditures shall be itemized in detail, appropriations shall be made under general classifications only, such as (1) personal service, (2) maintenance, and (3) repairs and replacements; that the administrative officers in charge of the institution be given the power of distributing the available funds granted under these general heads; and that this recommendation apply to all state educational institutions.

5. That the Dean of the New York State College of Agriculture be further relieved of detailed administrative duties, and to that end that a vice-deanship of resident teaching and a vice-directorship of research work be created, with minimum salaries of \$6000 for such positions.

6. That a salary of \$10,000 be provided for the Dean.

7. That the following salary scale be recommended as a minimum: for heads of departments, \$5000; for full professors, \$4000; for assistant professors, \$2500; for instructors, \$1500; for assistants, \$800; for stenographers, \$900.

8. That, whereas the small increase asked for by Dean Mann in the budget for 1920-21 will be wholly inadequate and will furnish no relief such as we desire, the salary estimates submitted by Dean Mann for the fiscal year beginning July 1, 1920, be revised in accordance with the minimum scale heretofore recommended, and that the changes in the

salary scale recommended by the Committee become effective for the fiscal year beginning July 1, 1920.

9. That the staff of the college be developed to meet the expansion approved by the several committees which have made studies of the needs of respective departments, and that the executive committee of this general committee make more detailed and specific studies and recommendations toward developing the work of the respective departments and toward adequate funds for maintenance.

10. That the executive committee submit to the various members who have attended the conferences at the College the recommendations of the general committee for their individual approval and signature.

11. That the executive committee take immediate steps to place the recommendations and conclusions of this conference on the needs of the College before the Agricultural Conference Board and before the leaders of all the farm organizations in New York State, and that such other steps be taken as are necessary to acquaint their various subordinate organizations or local branches with the recommendations of this conference as to the needs of the College.

12. That the executive committee and the Dean invite the press of the State to visit the College and study its service to the people of the State and its needs.

13. That the executive committee ask a subordinate committee consisting of one member of the faculty group and one representing farmers, to formulate a statement as to what the College of Agriculture means to the agriculture of the State.

14. That in working out these plans, special emphasis be placed on acquainting the consumers of the State with the value of the College to them.

The conference appointed a committee to carry out its recommendations. This committee reported to the Agricultural Conference Board on December 22, when the findings and recommendations of the conference of December 5 were unanimously approved and there was created a "Farmers' Joint Committee for the Promotion of Education in Agriculture and Home Economics in the State of New York" consisting of the following persons: William A. Mather, Chairman, Adams; E. R. Eastman, Executive Secretary, 303 Fifth Avenue, New York; James Fear, Recording Secretary, Holland Patent; Mrs. Lewis Seymour, 105 North Street, Binghamton; F. A. Salisbury, Phelps; C. F. Mason, Williamson; Daniel Dean, Nichols; State Horticultural Society, E. C. Gillette, Penn Yan; Dairymen's Association, H. C. Troy, Ithaca; State Grange, W. N. Giles, Skaneateles; Farm Bureau Federation, S. L. Strivings, Castile; Home Bureau Federation, Mrs. A. E. Brigden, Cortland; Dairymen's League, Inc., R. D. Cooper, New York; State Agricultural Society, C. F. Boshart, Lowville.

This committee, individually and collectively, has actively sponsored the cause of the College before the people of the State and the Legislature,

and large credit is due to its members, and to the great body of farmers who supported them and whom they represent, for the successful outcome of the legislative effort. The College of Agriculture and the people of the State are alike indebted to them for their public service ably discharged. The College belongs to the people of the State. They established it as a state institution, and they have ever come to its support in its times of special need. The College is deeply sensible of its increased responsibility for efficient, productive service to the State which the renewed expression of confidence and larger provision for its needs impose.

On December 20 the Agricultural College Council met to consider the recommendations of the Dean for the development of the College, these recommendations being substantially the program which was put forward by the farmers' committee and which represented the best judgment of the staff and of those who had studied the institution. The Council voted to "approve in principle the findings of the [farmers'] conference and concur in the larger conception of the importance and the requirements of the College." The Council made its recommendations in detail to the Board of Trustees, which affirmed these recommendations on January 3, 1920, for transmission to the Legislature. The result is that the Appropriation Act passed by the Legislature and approved by the Governor carries the following items for the State College of Agriculture:

1. For regular maintenance for the year 1920-21, \$1,270,888.80, an increase of \$260,170 over the appropriation for the year 1919-20. Of this increase nearly three-fourths is to be applied to increases in salaries of the staff. While these increases will still leave us considerably below the minimum scale recommended by the farmers' committee and concurred in by the Trustees, they afford very substantial relief to a deserving and grateful faculty.

2. Salary provision for a vice dean of resident instruction, a vice director of research, three new professorships in agricultural economics and farm management, a new professorship in plant pathology, and three additional assistant professorships in home economics.

3. For new construction, a special provision: "To further the development of the State College of Agriculture, Cornell University, providing for its extension through a plan to be approved by the Trustees of said University, by or before December 1, 1920, an authorization of three million dollars (\$3,000,000) is hereby made. The State Architect may employ such experts and other assistants as may be necessary for the proper development of plans, soil surveys, test pits, test borings, and conduct of such work, and their compensation shall be fixed by him and paid from appropriation made herewith, with the approval of the Trustees

of Cornell University. For the purpose of commencing such work, the sum of five hundred thousand dollars (\$500,000) is hereby appropriated."

The bill carries also a separate appropriation of \$17,000 for beginning the construction of a cold storage plant.

The appropriations for salaries of the teaching staff are combined for the several grades, heads of departments, professors, assistant professors, instructors, and assistants, in such a way as to allow the authorities discretion in fixing the salaries of individuals within these groups, except that a prescribed maximum salary and maximum number of appointees within each group shall not be exceeded. This departure from the narrow segregation which has obtained heretofore will afford a welcome measure of relief. It is to be regretted that there continues to be no administrative freedom or discretion in the adjustment of salaries of employees other than teachers.

The results of the legislative program as a whole have been successful and gratifying beyond our early expectations. With the many pressing demands made on the Legislature and the Governor for the maintenance and enlargement of the State's varied activities, the treatment accorded our requests this year has been notably generous. The sympathetic interest and appreciation of our requirements by Henry M. Sage, Chairman of the Senate Finance Committee, H. Edmund Machold, Chairman of the Assembly Ways and Means Committee, and Lewis F. Pilcher, State Architect, all of whom made special studies of the needs of the College by personal visits, and by Governor Alfred E. Smith, who approved all of the items submitted to him by the Legislature, made possible the accomplishment of the undertaking. Grateful acknowledgment is made to them. I desire also to record appreciation, on behalf of myself and my associates in the College, of the constant helpfulness of the President and members of the Board of Trustees throughout the entire course of our efforts.

Mention should be made of two other bills passed by the Legislature late in the session and approved by the Governor. One provides \$2700 for the erection of two sheds (\$1350 each) on the outlying experimental field plats at Churchville, in Monroe County, and at Alfred, in Allegany County. The second commissions the College to inaugurate special extension work in agriculture and home economics among the Indian wards on the reservations within the State. It carries an appropriation of \$10,000, which may be used, aside from the maintenance of general extension activities on the reservations, for the payment of scholarships, living expenses, and books for Indian men and women in short courses at the State College of Agriculture, the payment of travel expenses of specially chosen Indians for Farmers' Week and similar occasions, and as a rotary

loan fund to Indian farmers for the purchase of seeds, tools, and stock. In the organization of this new enterprise, the College has had the benefit of the services of Dr. Erl Bates, of Syracuse, whose years of active service in behalf of the Indians has placed him in the confidence of the tribes and has given him an exceptional grasp of their problems and means of solution. This work, the importance of which has been fully demonstrated, should be made permanent.

The proposed college of home economics

The teaching of home economics had its inception at Cornell University in the year 1900, when Miss Martha Van Rensselaer was appointed to initiate special work on the problems of farm women. Her first undertaking was the establishment of a reading course, which within less than one year attained an enrollment of six thousand readers. From this beginning the work has gradually expanded. In 1904, when the State established the College of Agriculture at Cornell University as the New York State College of Agriculture, it assumed responsibility for the promotion of the activities of the College, including the work in home economics. By 1907 this work had attained such proportions that the Trustees recognized it as a separate department in the College. In 1911 the State appropriated \$154,000 to provide a special building for housing the department. On September 20, 1919, the Trustees designated the department as the School of Home Economics in the State College of Agriculture, this action being taken in recognition of the rapidly increasing importance, scope, and specialization of the work, and the fact that the department had become practically a self-contained professional school; and in the request made by the Trustees to the Legislature at that meeting, the Legislature was urged to complete the school in buildings and staff as rapidly as possible.

The logical outcome of the growth of the work in home economics and the distinctive recognition coming to it, was the action of the Board of Trustees on January 3, 1920, requesting the Legislature to establish the school as a separate State College of Home Economics. Subsequently bills were introduced in both houses of the Legislature to accomplish the change. The bill passed the Assembly but was held in committee in the Senate. This was not altogether unexpected, as time is required to effect an appreciation of the larger importance of the field of home economics in state welfare. The bill will ultimately pass. It is inevitable that this field of special interest to women, with its own body of knowledge and range of activity, will be given the recognition which it deserves. The proposal at once received the indorsement of women's organizations and of thousands of individual women throughout the State.

The change proposed is little more than a change in name and in administration. The main lines of work in a professional college of home economics have already been provided by state appropriation. Such additions to the staff and to buildings and facilities as the work calls for will be required to take care of its normal growth, whether it is recognized as a separate college or continues as a school in its present relationship. The State will derive greater profit from the work which it has already established here when it gives to that work the larger recognition which will result from the change in name.

Affiliation with the New York Agricultural Experiment Station

One of the most gratifying and promising events of the past year has been the affiliation effected between the State College of Agriculture and the New York Agricultural Experiment Station at Geneva. The formal act of affiliation was the consummation of a discussion between the institutions extending over several years. The bond that has been established did not involve legislative authorization, but was effected on the basis of the powers which the authorities of the two institutions now have under the law. On February 14, 1920, the Committee on General Administration of the Board of Trustees of Cornell University took the following action:

Resolved, That the acceptance by members of the staff of the College of Agriculture of appointments to the staff of the New York State Experiment Station at Geneva, without pay and without required duties, is hereby approved, the members of the staff so appointed to be those mutually agreed upon by the Director of the Station and the Dean of the College of Agriculture.

Resolved, That the President is hereby authorized to nominate for appointment to the staff of the New York State College of Agriculture such members of the staff of the New York State Experiment Station at Geneva, without pay and without required duties, as may be mutually agreed upon by the Director of the Station and the Dean of the College of Agriculture.

Similar action had been taken by the Board of Control of the State Experiment Station a short time before.

Under the new arrangement each of the institutions will maintain its present organization and functions and no change will be involved in the status of the men affected in their respective institutions. The affiliation will promote the interests of both, which at times are closely parallel, and will make possible an exchange of work and workers between the two institutions. It will be possible for the staff of the College of Agriculture to have access to the materials and laboratories of the State Experiment Station, and the investigators at the Station can take advantage of the facilities at Ithaca. Conferences will be promoted between the workers at the two institutions, resulting both in a better mutual understanding of the work in progress at the two places and in the removal

of the likelihood of any unnecessary overlapping. It is hoped also that the arrangement will be advantageous to graduate students who may be connected with either institution.

While under the law both institutions are required to conduct investigations and research, and both have maintained some extension work, the relations between the institutions have been notably harmonious and cordial, and the affiliation has been mutually desired. The more intimate relationship now officially established promises an increasingly pleasant and beneficial association in future. The step is an important one in the furtherance of the State's program for the promotion of education and research in agriculture.

The members of the State Experiment Station staff who have been appointed to professorships in the College of Agriculture at Cornell University are: Dr. U. P. Hedrick, professor of pomology; Dr. L. L. VanSlyke, professor of dairy chemistry; F. C. Stewart, professor of plant pathology; P. J. Parrott, professor of entomology; Dr. R. S. Breed, professor of dairy bacteriology; R. J. Anderson, professor of animal nutrition; R. C. Collison, professor of soil technology; Dr. W. H. Jordan, professor of animal nutrition.

Members of the State College who have been appointed to places on the staff of the Experiment Station are: Dr. T. L. Lyon, chemist, Division of Agronomy; Dr. R. A. Emerson, geneticist, Division of Horticulture; W. A. Stocking, bacteriologist, Division of Bacteriology; Dr. L. A. Maynard, biochemist, Division of Biochemistry; G. W. Herrick, entomologist, Division of Entomology; Dr. Donald Reddick, botanist, Division of Botany; A. R. Mann, Agricultural Economics.

Increasing importance of economics

For many years the chief activities of the agricultural colleges and experiment stations have been concerned with problems of plant and animal production. With the enormous actual and relative increase in city populations, rapid changes have come. The problems of plant and animal growth are more important than formerly, but are no longer the only questions with which agricultural education and research are concerned. The rapid growth of cities and the relatively slow increase in numbers of persons engaged in agriculture means that the food production of each agricultural worker must be much greater than heretofore. With these changes, new problems of business methods on the farm, financing of farm operations, transportation and marketing of products, and the maintenance of satisfactory living conditions on farms, have arisen.

Now that agriculture is more of a business and less of a self-sufficient home industry, the problems of business organization and management

of farms are of the utmost importance. For many years this College has been doing extensive work in studying and teaching methods of farm organization and management. The data on costs of production of various farm products and on living conditions on farms have been of service to price commissions. The State Census of Agriculture tabulated by the former Department of Farm Management, and data obtained in cooperation with the United States Bureau of Crop Estimates on labor, housing, and living conditions on farms, have all helped to direct public activities related to agriculture. They have also aided in stabilizing conditions on farms. The price studies have been of help in steadying production. Studies are now being made of farm labor, the movements of farm population, the standards and the costs of living on farms, and the combination of agriculture and factory work for industrial employees.

Many persons leave the farms because they do not see the means of engaging profitably in farming without capital. Some studies have been made of the means by which such persons may acquire the necessary capital and credit. The means by which credit agencies may furnish the necessary capital for agriculture require study. Recognizing these needs, the 1920 Legislature provided a professorship in farm finance.

The large and constantly increasing quantities of food that must be moved over our roads, railroads, and waterways have created many new problems in transportation. A professorship in transportation has been provided for next year.

So many economies can be made by assembling business for quantity buying and selling that the organization of cooperative associations of farmers has been very rapid in recent years. The determination of the best methods for the formation and management of such associations and the dissemination of this knowledge is one of the important duties of the College. The wool auctions, the central packing houses for fruit, cooperative purchases of stock feed, and cooperative ownership of milk plants, are among the important developments in this field. Perhaps no problem is today arousing more controversy and causing deeper concern than the problem of distribution of food. Improvement in the methods of distribution to keep pace with the growth and congestion of population is one of the outstanding needs of the near future. A new professorship of marketing has been established for next year.

All this work in the College is now centered in the Department of Agricultural Economics and Farm Management, a combination of the former departments of Farm Management and Rural Economy effected by the Trustees on September 20, 1919. For the present and immediate future a large part of the work of this department must be given to inves-

tigation, in which results come slowly. Much has already been done. There are large numbers of regular and winter-course students seeking instruction in these subjects, and extension teaching among farmers has reached considerable proportions in response to insistent demands. As an indication of the importance attached to the work it may be pointed out that thirty-one graduate students from this and other countries are now registered for special study in the Department of Agricultural Economics and Farm Management.

The social phase of country life

It is becoming increasingly apparent that the problems of agriculture are not solely those of the technique of production and distribution. Agriculture is at once a vocation and a mode of life. If the farm enterprise is to have permanent success, life must be satisfying to the farm family. More economic production and more profitable prices for farm products are essential, but economic prosperity will not of itself make the life of the rural community fully satisfying. Many of the material advantages of the city can be purchased by farmers if they have more adequate incomes; but the superior opportunities offered in the cities for recreation, education, and social and religious life will continue to draw an undue proportion of the more ambitious from farms and villages until the rural community is so organized that it can compete with the city in the matter of attractions. The social problems of country life cannot be longer neglected if we are to maintain the best type of American citizenship on our farms.

Our new understanding of human nature and of society has been developed by the sciences of psychology and sociology chiefly with regard to life under urban conditions; but the use of the methods of these sciences in the study of rural life reveals parallel series of rural social problems challenging the best scientific ability. Indeed, it seems probable that thorough scientific study of the structure and process of rural society, representing the type of social organization under which the mass of mankind has lived from the dawn of civilization, may do much to reveal principles of social behavior which are essential to the solution of the problems of our more highly complex urban society. The increased contact of rural dwellers with cities, better communication within rural communities, and the more general reading of the press and periodical literature, are arousing the interest of these people in rural social conditions. Having received assistance from the College of Agriculture in their problems of production, the people of the open country now look to it for assistance in solving those of social organization. We are as yet meagerly equipped to meet these needs but have made a good beginning.

The chief effort of the Department of Rural Social Organization in the College at the present time is to give some fundamental training in the social problems of rural communities to undergraduate students, very many of whom will go into positions of leadership where they can educate public opinion to the importance of these problems and can arouse interest which will result in community progress. The demand for trained teachers and leaders in rural sociology and rural social work greatly exceeds the supply. Because of its pioneer work in the country life movement, Cornell University is expected to take a place in this new field, and it is hoped that strong courses for graduate students seeking to fit themselves for these positions may be developed.

The scientific study of rural social problems is but begun, and is now developing methods and inventing technique. Investigations in this field is slow and costly, being largely dependent at the present stage on the survey method and requiring a considerable volume of data before interpretation can be attempted. With the present unrest among the industrial and agricultural classes, it is of the highest importance that such investigations be pushed as rapidly as possible so that we may have some measure of scientific information as a guide for shaping social policy. There is already an urgent demand that immediate assistance be given to rural communities in planning such enterprises as community buildings, church surveys, recreation programs, and community organization.

This demand should be met without neglecting the more fundamental work of investigation. Without such a practical testing of the principles of rural social science so far tentatively stated, there can be no real proof of their validity, so that permanent advance in this field must always depend on the opportunity for successful application of the principles advanced. The College needs, and has requested of the Legislature, additional teachers for both the resident and the extension phases of the work. The fullest development of the teaching of the sociology of country life in this College will be conditioned on the recognition given to fundamental courses in sociology in the College of Arts and Sciences.

The rural education phase

Since the passage of the Federal Vocational Educational Act in 1917, funds from state and federal sources have made possible a considerable development of the Department of Rural Education. The regulations governing the expenditure of the funds provided for under the Vocational Act, however, make it necessary for the department to limit its instructional work to prospective teachers of vocational agriculture and home economics. This condition needs to be remedied by a proportionately larger appropriation of state funds so that we may meet the demands of a considerable

number of students who each year desire professional work but who wish to enter other phases of teaching than those of vocational agriculture and homemaking.

A larger responsibility than this, however, is before the College. Aside from its extension activities, which center in the Cornell Rural School Leaflet and the junior extension work, the Department of Rural Education has little contact with the problems of elementary education in the rural communities of the State. Both of the aforementioned activities are proving their worth, but the scope of the department needs to be broadened so as to relate its work to both the elementary and the secondary schools of the rural sections of the State if we are to make our full contribution to rural education.

The importance of this was forcibly brought to the College during the last Farmers' Week, when the State Conference of Farm Organizations passed a resolution asking the Department of Rural Education to organize a committee that should be representative of both the farming and the educational interests of the State for the purpose of formulating a program for rural school betterment. Sufficient time has not since elapsed to permit large accomplishment as a result of this action. It is already evident, however, that there is need for a larger and more exact body of information regarding school conditions in the State than is at hand. Our Department of Rural Education should have members on its staff who are free from the restrictions of the Vocational Educational Act so that they may cooperate with the State Department of Education in making such studies as will furnish the necessary data.

The need for a body of well-prepared men and women for leadership in developing the professional phases of rural education in the State becomes daily more apparent. Such men and women are required to administer and supervise the rural schools, and to prepare teachers for service in them. While these persons should be of the highest professional attainments, it is quite as important that they should be intelligently sympathetic with life in the rural community. They should be familiar with the economic and social problems of the community. The background of a college of agriculture makes it the logical institution to prepare persons for this service. Especially is this true in our own College, in which the economic phases of the work have a comparatively large measure of development and the sociological phases are well started.

The suggested development involves no duplication of the work of the State Department of Education. It will be a means of supplementing the activities of the latter. The College of Agriculture recognizes that responsibility for the administration and supervision of the schools of the State is vested in the State Department of Education. The suggested

additions will provide a means of furnishing trained leaders such as must be available if the State Department of Education is to carry forward a progressive program in rural education. They will also make possible such a degree of cooperation in investigative work as will strengthen the teaching in the Department of Rural Education and will furnish data that are needed for the guidance of the State Department of Education in administrative action.

Changes in the staff

During the year covered by this report there have been a number of important changes in the staff. We have lost the following valued teachers, who have accepted calls to other fields: Karl J. Seulke, Professor of Animal Husbandry; Mark J. Smith, Assistant Extension Professor of Animal Husbandry; John H. Voorhees, Assistant Extension Professor of Farm Crops; Warren K. Blodgett and James L. Strahan, Assistant Extension Professors of Rural Engineering; Lex R. Hesler, Assistant Professor of Plant Pathology; Royal Gilkey, Assistant Professor in Extension Service; B. A. Chandler, Assistant Professor of Forest Utilization.

The following appointments have been made since July 1, 1919: E. L. Worthen, M.S., formerly of the Pennsylvania State College, Extension Professor of Soil Technology; Dr. J. E. Butterworth, formerly Dean of the College of Education of the University of Wyoming, Professor of Rural Education, in charge of the work in rural school administration; Miss Cora E. Binzel, formerly of the University of Wisconsin, Acting Professor of Rural Education, in charge of the professional work with prospective teachers of homemaking; Dr. E. N. Ferriss, formerly of the University of Oklahoma, Acting Assistant Professor of Rural Education, in charge of the work in secondary education; J. D. Brew, B.S., formerly of the State Experiment Station, Assistant Extension Professor of Dairy Industry; Dr. E. L. Palmer, formerly of Iowa State Teachers College, Assistant Professor of Rural Education, in charge of the Cornell Rural School Leaflet; Dr. L. H. McDaniels, Assistant Professor of Pomology; Miss B. E. Scholes, B.S., Assistant Extension Professor of Home Economics; F. G. Behrends, B.S., Assistant Extension Professor of Rural Engineering; R. M. Adams, B.S., A.B., Assistant Extension Professor of Vegetable Gardening; Dr. H. W. Dye, Assistant Professor of Plant Pathology.

On May 1, 1920, the Board of Trustees appointed Dr. Cornelius Betten, who for five years has served the College with conspicuous success as Secretary and Registrar, to the newly created position of Vice Dean of Resident Instruction, a position for which he is eminently qualified by training and experience and the confidence of his associates. On June

21 the Board appointed Dr. W. H. Chandler to the new position of Vice Director of Research. Dr. Chandler came to the institution in 1913 primarily to engage in pomological research. When Professor C. S. Wilson was appointed State Commissioner of Agriculture in 1916, Dr. Chandler was made head of the Department of Pomology. His scientific accomplishments, together with his demonstrated ability in administration, commended him to his colleagues and to the Director for the more responsible duties of the vice-directorship of research. On June 21 the Board of Trustees appointed Dr. Robert P. Sibley, formerly of Lake Forest College, as Secretary of the College of Agriculture.

The student enrollment

The number of students registered during 1919-20 shows a partial return to pre-war conditions. That the return is retarded in comparison with that of other colleges in the University doubtless reflects the agricultural situation in the State, particularly the shortage of farm labor which in many cases forces the farm boy to remain at home. It is probable that the greater financial return in other industries also has its influence. The figures for 1919-20 and for the preceding year are given.

Regular undergraduate students	1919-20	1918-19
Freshmen.....	414	259
Sophomores.....	247	241
Juniors.....	253	197
Seniors.....	302	174
	<hr/> 1,216	<hr/> 871
Special students.....	89	43
Winter-course students		
Agriculture (General).....	231	44
Dairy Industry.....	55	14
Poultry Husbandry.....	48	7
Fruit Growing.....	22	.....
Home Economics.....	21	8
Flower Growing.....	10	3
Vegetable Gardening.....	9	7
	<hr/> 396	<hr/> 83
Summer school students.....	530	493
Graduate students.....	229	166
	<hr/> 2,460	<hr/> 1,656

The total number of different individuals registered during the year is 2356. The fact that the numbers of students in the upper three classes are in the inverse of the normal relation is of course due to the return of students from war service.

Phases of instruction

The changes in the courses during the year are not striking. In the new Department of Rural Social Organization a course on the rural family and one on social studies in the high school have been added. The Department of Meteorology has instituted a course on the use of meteorological instruments.

The School of Home Economics has added a course on health in the home, one on diet and disease, a teachers' course on foods and nutrition, and a seminary on nutrition. In connection with the course on diet and disease, clinical work was done with patients under the care of the university medical advisers; similarly, the teachers' course gave opportunity for clinical work in the Ithaca public schools. The feeding of a healthy babe and of an older retarded child was studied in connection with the course on nutrition and dietetics.

The Department of Forestry has rearranged its curriculum, abandoning the former plan of having both formal instruction and field work in the summer term. The lecture and recitation courses of this term have been transferred to the first and second terms. The three months of field work to be done with a forestry party or in a forest industry is moved forward from the first term of the senior year to the summer following the freshmen year, and in addition a month of field work under the direction of the department staff is required in a subsequent summer.

It is gratifying to record that for the second time the fellowship in landscape architecture in the American Academy in Rome is awarded to a graduate of the Department of Landscape Art. Among fourteen competitors, two graduates of the department — Ralph E. Griswold, '16, and Fabian McK. Smith, '17 — qualified in the preliminary trials, the former being given the final award with Mr. Smith standing second. Edward G. Lawson, '13, is just completing the fellowship term of three years which he won in the only previous competition.

During the year the Trustees of the University purchased the Mead farm of forty acres and made it available for the purposes of the State College of Agriculture. The farm has been rented by the College for a number of years. Because of its location, near the barns, it is a very valuable permanent addition to the facilities of the College.

THE EXTENSION ACTIVITIES

The organization of the extension service as such was effected on July 1, 1914. The period from 1915 to 1918 was one of rapid and wide expansion. The farm bureau system was developed for the entire State and the home bureau system for half the State, the junior work was established, and specialists were employed in thirteen of the sixteen departments of

the College to carry forward the technical demonstration work in the field. This expansion was made possible by increases in funds under the Smith-Lever and the state appropriation acts, and by the war emergency funds provided by the Federal Government.

The work was conducted during 1919-20 under the same administrative arrangement as in the previous year. The transfer of the office of state leader of Home Demonstration agents from the Extension Department to the School of Home Economics, and the placing of the county agent leader in charge of administrative relationships with county organizations involving both farm and home bureaus, has effected better correlation with both the subject-matter and the field organizations.

The fiscal year ending June 30, 1920, has necessarily been one of consolidation and coordination of the efforts of these various divisions, and the general rounding out and better relating of the college service to the county organizations cooperating in the support of county agent work.

Progress and results

The Extension Service is now more complete, more comprehensive, and more effective than ever before in its history. Much progress has been made in the organization of definite projects to meet the county programs of work. A few of the specific and noteworthy developments of the year are here recorded.

Better correlation has been brought about between county agents and specialists in solving county programs. The factor that has contributed the most to this end has been group conferences between county agents and specialists. The establishment of a regular systematic news service, prepared by specialists for the farm and home bureau news and furnished through the Office of Publication, has also helped.

The Extension Service has been made more nearly adequate to the needs of the State by the addition of specialists in entomology, farm crops, vegetable gardening, rural engineering, and home economics, and by the organization of the junior extension office. Monthly conferences of all members of the Extension Service have been held, and these have resulted in much better understanding of the whole program of the College and of the relation of its parts to one another, and generally in better team work.

Considerable progress has been made in bringing the facilities of the Service to bear on the problems of marketing and distribution as well as on those of production. This result has been attained more by a redirection of present forces than by the appointment of new persons. While only a beginning has been made, the total results are already large.

The initiating and successful carrying out of three Farmers' Field Days during the last days of June marked a new and promising effort to bring

farmers of the State into more direct and intelligent contact with the College of Agriculture and with its possibilities for service.

The reorganization of the reading courses in agriculture to bring them into better relationship with the general publication and news service, and the beginning of the development of systematic correspondence courses, also marks a progressive step.

Group activities

A large part of the extension work of the departments of the College is carried on through institutes, schools, and meetings in which two or more departments are represented. These are arranged by and through two central extension offices, one in agriculture and one in home economics. All these activities, in fact practically all extension work except state-wide meetings and exhibits and the distribution of bulletins, are conducted through and in cooperation with the county farm and home bureaus. The organization and administration of these bureaus is supervised by the central farm and home bureau offices under the general direction of the county agent leader, who is responsible for working agreements with the county associations, for financial arrangements, and for the general supervision of the county agents' work.

The extent and character of the activities of the Extension Service can best be indicated in a summary of meetings, attendance, publications, and news printings. The personal contacts here recorded, numbering more than a million, probably represent actual contacts with from 150,000 to 200,000 different individuals.

SUMMARY OF GROUP ACTIVITIES

Agriculture

Type of activity	Number of persons reached
Extension schools, 49	1,699
Farmers' institutes, 379	29,312
Lectures by specialists, 1,040	65,917
Demonstration meetings, 1,143	44,106
Conferences, 884	19,009
Farm visits and inspections, 3,885	3,885
Farmers' Field Days, 3	7,000 (est.)
Better-Seed Special, 1	1,916
Farmers' Week, 1	2,654
Exhibits at State Fair	No record
Exhibits at county fairs, 25	48,600
Total	224,098

Home economics

Extension schools, 41	2,735	
Lectures by specialists, 418	26,859	
Demonstration meetings, 344	15,562	
Conferences, 86	1,707	
Exhibits at State Fair	No record	
<hr/>		
Total		46,863

Miscellaneous

Lectures, committee meetings, and conferences by county agent leaders, 211	12,068	
Meetings and demonstrations organized or addressed by county agricultural agents, 6,587	385,913	
<hr/>		
Total		397,981
Lectures, committee meetings, and conferences by home demonstration agent leaders, 361	18,673	
Meetings organized or addressed by county home demonstration agents, 4,466	213,185	
<hr/>		
Total		231,858
Meetings organized or addressed by state and county junior extension leaders, 8,317		137,433
<hr/>		
Grand total of personal contacts through Extension Service		<u><u>1,038,233</u></u>

Farm and home bureaus

The farm bureau movement was begun in this State about nine years ago (in 1911) and its organization was completed in 1918. It has had a rapid but sound growth, chiefly because it is based on the principle of self-help as exemplified in the county associations.

Two outstanding developments have marked the past year in relation to the individual farmer membership in the fifty-five farm bureau associations. The first of these was the almost unanimous decision by the several associations to amend their constitutions to provide for an increase in the membership fee from \$1 to \$2 for the year 1920. The second was the excellent response from the farmers in returning a membership of 55,766 as of June 30, 1920. While this means 10,959 less members than in the preceding year, it should be noted that, since the fee was doubled, the amount of funds contributed by the farmers was nearly doubled. The reason for the increased membership fee was that the bureaus needed more funds to carry on their programs and to support state and national federations. A more liberal financial support of their organizations by the farmers may also beget a more active interest, and more real work for their success.

Home bureau work, which was begun in 1915 but experienced its largest development during the war, has made much progress toward permanent organization in the past year. Home demonstration agents are now employed in twenty-five counties and two cities. The central office of home bureaus, located in the School of Home Economics, works under the general direction of the county agent leader in making the cooperative contacts with the executive and advisory committees in the organization and supervision of the home bureau activities. A further report of the work is given on page 48, under *Home Economics*.

In the twenty-five counties already organized, there is being effected as rapidly as possible a reorganization providing for a joint farm and home bureau association, with two departments, jointly directed by a board of directors of men and women. In these counties the organization is recognized by law as a *County Farm and Home Bureau Association* (Section 28-A, Chapter 499, Laws of New York, May 9, 1919).

The executive committees. The executive committees work more and more efficiently year by year. The reasons are obvious. As the work develops and broadens, the responsibilities of the bureaus are increased. The members of the executive committees, realizing these responsibilities, are giving more serious thought to directing the work of the county agent. They give freely of their time and their energies.

Defining relationships. For the purpose of defining clearly the relationships and points of contact between the state office and the county associations, and for purposes of record, memoranda of understanding have been drawn up by the state office and adopted by the county associations covering the following points:

1. A revised form of constitution and by-laws for county farm and home bureau associations.
2. An agreement between the county association and the county board of supervisors concerning county appropriations.
3. A revised agreement between the state county agent leader and each county association covering the maintenance and operation of the farm and home bureau for 1920.

Correlation and systematization. Considerable progress has been made since last year in correlating the methods of work in the field with projects, and in the offices with records and reports. Progress has been made also in the detailed administration of the work. A new form of double-entry financial records has been installed for both branches of the work, and provision has been made for annual inventories of the property of the bureaus. Material progress has been made in bringing the field program of the agents into line with the projects of work organized and supervised by specialists, although much yet remains to be done.

An advance in methods of holding conferences of county agents and extension specialists was furnished in the five regional conferences held in the early part of April, 1920. At these conferences, which were of three days duration, opportunity was provided for the county agents to confer individually with each extension specialist, to make definite plans for the field work during the coming season, and to make arrangements with specialists for a definite amount of assistance. As a result of these conferences a much better understanding and acquaintanceship was created.

Supervisory activities of central office staff. To assist in developing the efficiency of every farm bureau association in the State is the chief work of the staff of the central office. The activities of this force fall under at least five heads:

1. Assisting agents and executive committees in strengthening and developing their county associations.
2. Holding personal, district, and state-wide conferences of agents.
3. Rendering personal assistance to agents in the correlation of office and field work.
4. Effecting cooperative relationships between farm bureau associations and other interests.
5. Inspecting and summarizing reports and records.

Changes in personnel. An unusual number of changes in the personnel of the central office staff and among the county agents have taken place within the past fiscal year.

Professor H. E. Babcock, formerly State County Agent Leader, resigned from that office on June 1, 1920. Jay Coryell was promoted from Assistant Leader to County Agent Leader, assuming his new duties on June 1.

T. E. Milliman, who had been Assistant County Agent Leader during the greater part of the year, resigned on October 1, 1919, to assume the managership of the organization department of the Dairymen's League. L. A. Toan, Assistant State Leader, resigned on June 1, 1920, to take up work in connection with a seed firm in western New York. To fill these respective vacancies, L. R. Simons, formerly agriculturist in the office of the States Relations Service at Washington, D. C., and C. A. Taylor, who for the past five years has been county agent in Herkimer County, were appointed. Mr. Simons and Mr. Taylor assumed their new duties on June 1, 1920.

Between July 1, 1919, and June 30, 1920, twenty-three county agents, or nearly 42 per cent of the entire number, resigned or were changed from one county to another. Many of the county agents have left the work primarily because of better financial opportunities elsewhere. This has been the largest overturn among county agents in New York State since the bureaus were organized.

Schools, institutes, and community meetings

Extension schools in agriculture. During the winter of 1919-20 there were 49 farm demonstration schools held, with a total enrollment of 1699. This is nearly double the number of schools held during the winter of 1918-19, and more than double the total enrollment. In spite of the severe winter there were eighteen schools with a roll of 40 or more, as against three for the preceding year.

The three-days schools begun last year proved very popular, 31 out of the 49 schools held this year being of that type. Most of these were for special work, such as with gas engines and milking machines, and for potato growing. There were three potato-growing schools held, with an average enrollment of 38 persons. The five milking-machine schools, with an average enrollment of 41.6, also proved highly successful. Probably the most popular of the new three-days special schools were the gas-engine schools, of which ten were held with an average enrollment of 29.9. Although most of the three-days farm-mechanics and milking-machine schools required an additional instructor on the third day, the average number of instructors (2.4) is lower than ever before.

Special effort was made this year to introduce demonstration material into the courses, and the students were urged to furnish material for local exhibits for study and judging.

A summarized statement relating to the extension schools follows:

Number of schools held	49	
Counties reached	28	
Total enrollment (48 schools)	1,699	
Average enrollment (48 schools)	35.40	
Largest enrollment	72	(Rochester)
Smallest enrollment	6	(Troupsburg)
Highest percentage of attendance	90.25	(Interlaken)
Average attendance at each session (49 schools) . .	23.48	
Average number of instructors to each school . . .	2.4	
Length of school season (weeks)	16	

Instruction was given as follows:

	Number of days	Number of schools
Agricultural chemistry	2	1
Animal husbandry	56	16
Dairy	15	5
Entomology	4	2
Farm crops	46	14
Farm management	7	3
Plant pathology	15	6
Pomology	19½	7
Poultry	8	3

	Number of days	Number of schools
Rural engineering.....	147	26
Soils.....	33	8
Vegetable gardening.....	2	1
Miscellaneous.....	9½	3
(Outside assistance)		

Farmers' institutes. This year 21 more farmers' institutes were held than in the season of 1918-19. The number of institutes scheduled was 395, but 16 of these were canceled because of illness in the communities or because of bad roads. The attendance at the institutes this year, however, showed a considerable decrease. The average attendance for the whole season was 38, as compared with 56 for last year.

Homemakers' conferences were held at all but 19 of the institutes. The decrease in attendance at these conferences was not so great as in the meetings for men. This year the average attendance at homemakers' conferences was 22, while last year it was 26.

Seven two-days institutes were held this year. Twelve persons were employed regularly, and thirty-nine were employed at irregular intervals or for short periods. The following table shows comparative figures for 1919 and 1920:

	1918-19	1919-20
Number of meetings.....	358	379
Number of sessions.....	745	772
Number of homemakers' conferences.....	321	360
Attendance		
Total.....	41,642	29,312
Men.....	33,160	21,429
Women.....	8,482	7,883
Average attendance per session.....	56	38
Women.....	26	22

Community meetings. The greater part of the extension activities in the past year comprised single-session meetings. During the winter such meetings are more or less general in character, though most of them are called for the purpose of discussing some specific problem. During the summer the specialists give their chief energies to training, directing, and supervising local leaders in the conduct of field trials and making local demonstrations of the value of general recommendations. This work is described in the reports of the several subject-matter departments.

The totals of meetings other than schools and farmers' institutes for the eleven months ending May 31, 1920, are: 3746 days in the field; 875 demonstrations, attended by 45,135 persons; 1024 lectures to 63,759 persons; 788 conferences and conventions, with 17,219 present; 3147

inspections; and 218 days with exhibits at fairs and similar gatherings.

There were in addition a number of group projects, as Farmers' Week, summer field days, demonstration trains, exhibits at fairs, district conferences with county agents, and other special conferences, which are reported elsewhere.

Better-Seed Special. In the spring of 1920, a "Better-Seed Special" demonstration train was operated over the lines of the Lehigh Valley, the Erie, the New York Central, the New York, Ontario, & Western, and the Delaware and Hudson Railroad Company, through 21 counties in eastern New York. This was the continuation of a similar train operated through western New York the preceding year.

The cars were in operation 22 days, making 46 stops in the 21 counties, with a total attendance of 1916 persons, or an average of 41.7 to each stop. Unusually difficult travel on most country roads during March resulted in low attendance.

Farmers' Week. The thirteenth annual Farmers' Week was held at the College February 9 to 13. The total registration was 2654, with a probable attendance much greater than that. It was apparent, however, that there was a material falling-off in the attendance as compared with previous years. This is believed to be due to difficulties attendant upon illness and interruptions to transportation. The program did not differ materially in character from that of previous years and the interest was good throughout. A country newspaper day was a new feature. In addition to the regular staff of the College of Agriculture, seventy-four outside speakers took part in the program, which may be summarized as follows:

Lectures given	243
Demonstrations and round tables	105
Conventions and conferences	9
Practice periods	32
Exhibits	20
Entertainments and banquets, including motion pictures	11
Contests, including students' judging and speaking	10
Registration for week	2,654

Field Days. The Farmers' Field Days, held on June 30 and July 1 and 2, established a new event for this College, although other similar institutions have for several years held large summer farmers' meetings at the experiment stations. The primary object is to provide opportunity for relatively large groups of interested persons to inspect, under the guidance of members of the college staff, the farm operations and experiments being conducted at the college station at a season of the year when growing crops can be viewed to the best advantage, affording in many cases ocular demon-

stration of the relative value of certain practices, and particularly the results of long-time experiments.

For the most part, farmers came for one day only, and nearly all came by automobile. The middle day of the three brought by long odds the largest attendance. It did not seem practicable to register the visitors. It is probable that there were 5000 present on the middle day alone, and about 1000 on the first and on the last day. The project was considered entirely successful, and it will be repeated, with certain minor modifications suggested by this initial experience.

Junior extension

Much progress has been made during the year in the junior project work carried on by the Department of Rural Education in cooperation with the State Department of Education. In addition to these organized efforts, some work has been done in every county in the State through county agents, superintendents of schools, teachers, and interested individuals, particularly in effecting organization on a permanent and county basis. Eighteen counties have employed leaders during all or a part of the time.

Twenty-one counties had definite organizations for directing the work during 1919. These organizations, known as county boards of junior extension, are composed equally of representatives of county farm and home bureaus, and representatives of the schools including school superintendents. These boards act in an advisory capacity, but they are usually responsible for the raising of local funds and for the local direction of the work.

These county leaders have been helped by two college specialists in homemaking, one in gardens and crops, and one in poultry. The College has furnished publications and record books also.

The scope of the work is indicated by the following twelve approved projects:

Gardening
Potato growing
Corn growing
Bean growing
Poultry raising
Rabbit raising

Calf raising
Pig raising
Sheep raising
Cow testing and record keeping
Food (including canning)
Clothing

The work in each of these projects is divided into three classes or grades, according to the age of the worker, as follows: Class A, children up to 11 years old; Class B, children from 12 to 15 years old; Class C, girls and boys from 16 to 19 years old.

There were 263 leaders, some of them paid and some voluntary. These leaders reported a total enrollment in all projects of 20,686 workers, of whom 14,817, or 17.6 per cent, had reported their projects completed on December 1, 1919. Local supervision has been provided by the school boards of education.

County and local fairs have shown an increasing interest in the work, and many school and community fairs or achievement days have been held, at which project workers have received achievement pins furnished by the State Bankers Association, and certificates furnished by the State Department of Education. The State Fair Commission, through generous appropriations, made possible the exhibition of each of the projects in a separate booth and the paying of the expenses of eight of the championship demonstration teams to the fair. These teams were later sent with exhibits to the Eastern States Exposition at Springfield, Massachusetts.

Publications

A new development in the Office of Publication during the year was the beginning of extension work with country newspapers, recognizing the country newspaper as an important agency in rural development. An investigation as to present tendencies in the field of the country weekly revealed the needs which the College has endeavored to meet by furnishing a regular news service in agriculture and home economics to the rural press. A country-newspaper conference was held at the College during Farmers' Week, and ribbons were awarded respectively to those papers that presented the best front page make-up, and to those that served their communities best.

The major part of the work of the Office of Publication has to do with the extension of agricultural information through print. This is done by means of the regular publications listed as a part of this report, by the Extension Service News, by the Service Sheet to country newspapers, by the regular news service to the farm bureau papers of the State, by counsel and conference with the farm and home bureau managers for the improvement of the papers issued by each county farm bureau, and by news service to the daily and the weekly press.

The news service to the press has been increasingly used, and the circulation of news items during the fiscal year was more than one hundred million separate printings, as compared with 67,236,205 during the preceding year. This record is based on clippings actually seen at the College.

Among the resolutions passed by the Association of Agricultural College Editors at its meeting in Amherst, Massachusetts, on June 30, 1920, was the following: "*Resolved*, that this Association indorses the pioneer efforts in 'extension work for country newspapers' made by the New York

State College of Agriculture at Cornell University, and recommends that it be brought to the attention of the States Relations Service, United States Department of Agriculture, and to the state directors of extension, with a view to including 'extension work for country newspapers' in the extension programs of other States." This association consists of representatives from forty-one colleges.

Ninety-three publications of the College and Experiment Station, with a total circulation of more than a million and a half copies, have been printed and distributed to the people of the State and to teachers and investigators in other States. A list of these publications is given on pages 74 to 77.

On July 5, 1919, the rented storage warehouse in which reserve supplies of publications were kept was burned to the ground, together with its contents. Provision has since been made for a more suitable storage building.

Reading course for the farm. During the past year a committee has made a study of the reading-course situation and has submitted recommendations which have been adopted, with a view to putting the systematic study of reading-course lessons on a more definite footing. These recommendations provide for the elimination of duplications in mailing lists, for the reduction of the distribution of reading-course lessons to those actually returning the lessons, for the more careful supervision of the readers, and for the establishment of Cornell farm study courses. It is planned to use the bulletins of the United States Department of Agriculture and the Geneva Experiment Station in the farm study courses, and to expand the advanced reading courses.

In the latter part of 1919, the supervisor of the reading course, Assistant Professor Royal Gilkey, who during a leave of absence had been teaching agriculture at Greene, New York, decided to continue teaching, and resigned from his position at the College. During Professor Gilkey's absence Professor D. J. Crosby carried the work of his office. Before the end of the fiscal year arrangements had been made to transfer the work of the Farm Study Courses to the Office of Publication.

Extension in rural education. The appointment of Assistant Professor E. L. Palmer, in the Department of Rural Education, as editor of the Cornell Rural School Leaflet, has made it possible to again issue that publication regularly. The calls that came from district superintendents and teachers during the year when publication was suspended is ample evidence that the Leaflet is filling a real need in the rural schools of the State.

Exhibits

Each year the College exhibits some phases of its work at the State Fair, at the county fairs so far as its funds and the time of its staff permit.

and at certain other expositions as occasion demands. This work is a severe tax on college resources, since no special provision, either of men or of money, is made by the State for the work. Provision for these exhibits constitutes one of the needs of the institution.

The State Fair. In 1919 the College featured as its main exhibit at the State Fair the production, care, and handling of clean milk and the use of milk as a food. The central part of the exhibit was a model layout for a dairy farmstead. The model showed not only the arrangement of the entire farmstead, including plans for planting the home grounds, the gardens, the orchard, and the poultry and pig yards, but also, by plans and in model form, two houses, one for the owner and one for the tenant, and the dairy barn, the ice house, and other buildings sufficient for a dairy farm of 150 acres. These plans were complete in detail, showing floor plans and specifications for building and the approximate cost of construction. By enlarged photographs and charts, different types of dairy barns were shown, giving the visitors at the fair very definite information on the construction of farm buildings. Adjacent to the farmstead was an enlarged model of a section of the dairy barn, showing the method of construction and the lighting and ventilation systems.

Other parts of the college extension program which were illustrated by exhibits at the State Fair included the care and handling of milk, with emphasis on proper cooling; the value of milk as a food, especially for growing children, demonstrated by milk drinks sold over a "milk bar"; clothing materials and the making over of garments; the making of butter, cheese, and ice cream; the value of artificial lighting for egg production; soils of the State and their proper treatment; floriculture; publications; and the junior project work with girls and boys. While the setting up of such exhibits and their proper use during the fair is difficult and expensive, an excellent opportunity is afforded for graphic presentation to thousands of persons who might not otherwise know of the work of the Extension Service of the College.

County fairs. During the year 1919 the College cooperated with the county farm bureaus in making exhibits at county fairs. Five departments of the College assembled exhibits in response to requests, these exhibits being used as parts of the county farm bureau exhibits. The subjects covered were drainage, injurious insects and plant diseases, legumes, and sheep and wool.

Exhibits were scheduled for 27 counties, but delayed transportation necessitated six cancellations and exhibits were actually shown in 21 counties. Three of these counties had two exhibits, and one county had the same exhibit twice. Approximately 48,600 persons saw the exhibits, and 1351 consulted the specialists in entomology, poultry, and rural engineering, who spent 68 days at the county fairs.

Other exhibits. Exhibits were made also by departments of the College at the Rochester Industrial Exposition, at the annual meeting of the State Fruit Growers' Association, at the Madison Square Garden Poultry Show, at the New York Milk and Child Health Exposition, and at other meetings. At the last-named exposition there was a paid attendance of 23,928 persons. The exhibit of the College at the annual conference of the American Association of Agricultural College Editors was the only one to win awards in all three classes represented, and it took first place as best exhibit.

Animal Husbandry

Extension work in animal husbandry is one of the largest extension enterprises of the College, and, because of the importance of livestock, particularly dairy cattle, in the State, one of the most in demand. Five members of the department gave their entire time to it during the past year, and several others gave considerable time.

The lines of work emphasized during the year included better-stock and bull associations in 26 counties, dairy and pig-feeding projects in 18 counties, sheep and wool-marketing associations in 36 counties, cow-testing associations in 33 counties, 30 or more barn demonstrations, 30 active breeding clubs, and fairs and exhibits. The work was well distributed throughout the State.

At the beginning of the second semester Professor M. J. Smith resigned as sheep specialist. As a result the work with sheep has been handicapped. Through the cooperation of the Bureau of Animal Industry of the United States Department of Agriculture, Dr. B. J. Cady gave us much assistance during the remainder of the year, particularly in connection with the health of farm animals.

The supervision of advanced registry records of dairy cows has been continued. This phase of the extension work demanded the time of from twenty to one hundred men at different periods during the season. Assistance was given to about five hundred breeders in the State. This is a main feature of the extension work. In addition to its educational value, it promotes the financial advantage of the breeder through stimulating interest in purebred stock.

Botany

No extension specialists in botany are employed, but considerable extension work is done by the regular staff. Ten thousand cultures containing organisms for inoculating soil in preparation for legume crops have been prepared and distributed to farmers, chiefly through county agents, during the year, and assistance has been given to several hundred farmers in weed identification and eradication.

Dairy Industry

On September 1, 1919, G. C. Dutton, extension instructor in the Department of Dairy Industry, resigned to accept a position at a larger salary elsewhere, and on November 1 Dr. James D. Brew was appointed in his place as Assistant Extension Professor. Dr. Brew has specialized on problems relating to market milk supply. Mr. Ayres has continued his field work among the dairy manufacturing plants of the State, giving special attention to helping former students in their problems. Four-tenths of his time goes to extension; the remainder is spent in teaching at Ithaca.

Extension in dairy industry has dealt with the production of high-grade milk, the marketing of dairy products, the Babcock test for butterfat grading of milk, the value of milk of different compositions, and problems in creameries.

Entomology

Three main lines of extension in the Department of Entomology are: first, demonstrations in the control of injurious insects affecting fruit, vegetables, and domestic animals, conducted by Professor C. R. Crosby and M. D. Leonard; second, demonstrations in bee keeping, conducted by George H. Rea; and third, work with birds and mammals, conducted by Dr. A. A. Allen and C. R. Leister.

In some counties the demonstrations on injurious insects affecting fruit and vegetables is done through the field assistants whose work is described elsewhere under "Plant Pathology," and is under the immediate supervision of Mr. Leonard. In other counties, entomological demonstrations are confined principally to showing how to control insects when serious outbreaks occur, as, for example, of grasshoppers, cutworms, or army worms. The control of the ox warble fly is being organized in certain dairy counties.

In August, fields in the wheat-producing regions of the State were examined to determine Hessian fly infestation. The facts as to the degree of infestation thus learned afforded the basis for definite recommendations for fall sowing. The benefits to growers who followed college recommendations more than paid the entire cost of the work.

Extension in bee keeping has acquired much popularity during the past two years. It has been aimed chiefly at the control of American and European foul brood by educational methods. These diseases, together with improper wintering, have caused the loss of not less than half of the bees in this State. Hence extension efforts have been aimed at control through better wintering methods, cleaning up old infections, and preventing new ones. Bee breeding through purebred stock is another method used for improvement. The organization of 21 new county beekeepers' associations, the holding of county meetings and field days at which the

methods mentioned above have been discussed and demonstrated, and the arranging for lectures and schools, have been the chief means used by Mr. Rea.

In the work with birds, the effort has been principally in the direction of conservation and encouragement, although some attention has necessarily been given to questions of control of certain partly injurious kinds. In the case of mammals, the work has consisted almost entirely in giving assistance in the prevention of injury to fruit, trees, and crops, by meadow mice, moles, rabbits, and woodchucks. The correspondence on these subjects is particularly heavy.

Deserving of mention as part of the extension work of the department are the following:

The work of Dr. James G. Needham, in cooperation with Dr. E. L. Palmer, in the preparation of a Rural School Leaflet in the interest of keeping the waters clean, and that in cooperation with the Conservation Commission in the direction of a biological examination of Lake George; the work of Dr. G. C. Embury in cooperation with the University of Washington in inaugurating in that institution a study of fish-breeding problems; and the work of Dr. P. W. Claassen and Hazel Branch in cooperation with the Milk Conference Board in developing biological methods for disposal of milk wastes.

Farm Crops

Demonstrations of methods of crop growing have been carried on in all parts of the State by the Department of Farm Crops in cooperation with the local farm bureaus. The chief lines of activity consisted of the growing of silage corn and of husking corn, pasture improvement, vetch culture, the establishing of alfalfa, and potato culture, while minor attention has been given to sweet clover, wheat, oats, and other crops. The demonstrations were laid out with the object of teaching methods of crop growing or of showing that certain strains or types of seed are the best.

Great interest in pasture improvement has been manifested. Demonstrations have shown farmers that pastures can be improved, and that such improvement is valuable and economical. Applications of pasture grass mixtures, acid phosphate, and lime have been used with good results. Some culture, such as harrowing or plowing, has been shown to be advantageous. So good were the results of these demonstrations, and so keen was the interest of farmers, that pasture improvement has been undertaken by farmers in New York on a greater scale this season than ever before. In Otsego County more than one hundred farmers are this year carrying on pasture improvement under the direction of the county agent.

Demonstrations with alfalfa have shown that the use of seed of the variegated alfalfa grown in the Northwestern States promises success. Not only does such alfalfa usually yield more, but it is more permanent. Through the activities of the extension specialists in farm crops and the various farm bureaus, more than 100,000 pounds of hardy northern-grown alfalfa seed of high quality was brought into New York during the spring months of 1920.

For several years the Department of Farm Crops, in cooperation with the State Potato Growers' Association, has been encouraging the production of certified and inspected seed potatoes. The attention of farmers has been called to these potatoes. Usually, however, the supply of such seed has been much larger than the demand. Comparisons have recently been made, through demonstrations, of the yield from the best strains of such certified seed and that from common seed in the hands of farmers. In Orleans and Seneca Counties in 1919, the average yield of the best strains of certified seed exceeded that of common seed by about 100 per cent. The result was that in the spring of 1920 the demand for certified seed was much larger than the supply, and for the first time the whole supply of certified seed was used for planting. Efforts are now being made to increase the best stocks so that there will be enough to meet all planting needs. It is believed that by this work, yields may be greatly increased without added efforts in cultivation.

Similar demonstrations with other crops give results equally striking. Efforts are being made to increase the best strains and to have them adopted by farmers.

To further this work the fields of farmers growing good strains of the various crops are inspected by the extension specialists of the department. Crops which are well grown, of a pure variety, and free from noxious weeds and disease, are listed. During the past year about one hundred farmers had fields of wheat, rye, oats, corn, or beans which passed such inspection. Through printed information from the College and through the county agents, farmers were informed of the existence of these supplies of good seed.

Assistance in judging seed exhibits at county and community fairs has been given by the department. This affords an opportunity to condemn poor seed and unsuitable varieties, and to commend those which are desirable. A crop contest has been conducted in connection with the Cayuga County Farm Bureau.

The greater part of the months of November, December, January, February, and March were devoted to teaching groups of farmers at three- or five-days extension schools, at community meetings, and at farmers' institutes. In such teaching, especially at the schools, some of the basic

principles controlling crop production were given, in addition to reviews of results of near-by field demonstrations.

During the spring of 1920 the department was busy in making arrangements for its demonstration program for the spring and summer. More than fifteen hundred demonstrations were called for. Material was gathered, plans were formed, and the following demonstrations were made: oats 300, potatoes 125, pasture improvement 175, silage corn 90, miscellaneous 50.

During the past year about fifteen hundred letters of inquiry, on a large list of topics, have been answered. Most of the letters came from farmers who wanted information about methods of crop growing, about the adaptation of certain new crops, about seed supplies and varieties, and about destroying weeds. Many inquirers sent samples of economic and weed plants for identification. Not a few sent samples of seed for examination as to variety, purity, and germination.

During the year two men have given all their time to extension activities in the department, and for seven months of the year a third man devoted about two-thirds of his time to this work.

Farm Management

Although the services of the extension staff of the Department of Farm Management have been in great demand and a large proportion of its energy has necessarily gone into extension activities, results are difficult to measure because of the nature of the work and because results in improved farm management cannot be immediately apparent. The activities have included keeping cost accounts; surveys made by letter and by personal farm visits, the returning of summarized surveys to farmers, and publication of the results of the surveys; presentation of farm management facts at farm meetings, schools, demonstrations, Farmers' Week, and elsewhere; and many personal conferences with groups and individuals. In all nearly 9000 individuals have been reached.

Some of the outstanding achievements include: the return of 159 records for 1919, and the obtaining of the 1920 records on 154 farms in Niagara County,—the sixth successive year for these farms; the tabulation of 724 Livingston County records; the opening, supervision, and closing of complete sets of cost accounts on 41 farms; the distribution, chiefly through county agents, of 3085 inventory and 4180 cash books to farmers at cost; and the tabulation of several labor surveys for dairy-men. A thorough study of the costs of growing canning crops, which may serve as a basis for the more intelligent determination of the value of these crops as between growers and canners, has been undertaken;

more than six hundred records of the cost and operation of farm tractors have been obtained; and much time has been given to the preparation and dissemination of information on prices of farm products, especially dairy products.

A survey by questionnaire, made in cooperation with the United States Bureau of Crop Estimates, of the farm population in New York State as compared with that of last year, the supply of farm labor, and the vacant houses on farms, has attracted wide attention. It was shown that the number of persons on farms in 1920 was 3 per cent less than in 1919, and that there were about 24,000 vacant habitable houses on New York State farms.

Marketing and cooperation. The main marketing problems in this State may be grouped under four heads: first, production of a better article, properly graded, standardized, and packed; second, improved storage of every description; third, improved transportation not only by steam railway but also by rural motor express; and fourth, improved financing and short-term credit, involving the use of warehouse receipts and of trade acceptances.

Most of the work done by the College looking toward the production of a standardized and improved article is being done in other departments than Farm Management. Much of the effort of many of the subject-matter departments looks toward the improvement of the quality of farm products and their better grading and packing. While this is probably necessary and desirable, there is abundant opportunity for better correlation and general direction along the lines of marketing experience and sound business principles. Results in improvement of products from the marketing standpoint are discussed under subsequent headings. Especially noteworthy are the results in marketing of fruit, vegetables, grain, milk, and eggs. Very little has been accomplished by the College as yet in the improvement of storage facilities.

A beginning has been made with transportation problems by the gathering of data for future use. The extension specialist in this field was a member of the State Highway Committee, and through this association he was able to assist in the development of the rural motor express.

Work in promoting improved farm finance and short-term credits was confined to the preparation and sending out of information through the press. Assistance was given to one or more cooperatives in the auditing of their accounts.

Much time and effort was spent in gathering data and preparing information, and by far the largest number of persons reached by any means were reached by articles sent out through the Office of Publication. A little more than eleven hundred persons were reached through field meet-

ings. Marketing programs were prepared and given in Farmers' Week and on the Field Days. The Merchants' Institute, or conference of country storekeepers, held on the latter occasion was considered the outstanding piece of work in this department during the year. Some assistance was given to farmers' organizations in developing their big marketing programs—to the Dairymen's League with milk, to the fruit-growers' cooperative packing house with fruit, to the canning-crops growers' association with the crops grown by its members, to the sheep association with wool marketing, and to the Grange League Federation Exchange, Inc. The marketing of hay received attention but led to no definite action.

Forestry

Extension work in forestry, under the immediate direction of Assistant Professor Collingwood, proceeded during the year in accordance with the program previously adopted. Special emphasis was placed on attempts to organize the cooperative marketing of forest products by community groups; on the collection of information about the maple sugar industry; on encouraging the establishment of forest plantations; and on efforts, particularly by means of demonstration areas, to foster proper methods of handling farm woodlots and other woodlands. During the year 13 lectures were given, with a total attendance of 628; five circular letters were sent out to 313 persons, and, in general extension correspondence, 912 other letters; and 22 articles of varying length were prepared for farm bureau and other newspapers.

Home Economics

The extension activities of the School of Home Economics for the year 1919-20, conducted by ten full-time and two part-time specialists, has aimed to promote three main projects—nutrition and foods; clothing, and hygiene and sanitation. In addition some incidental work has been done by other members of the staff on household management, housing and furnishing, recreation in the home, and community enterprises. These seven points really constitute the extension program of the School, and therefore the program is only about half developed. The promotion of the latter four lines awaits the appointment of extension specialists in those fields.

The work has been carried forward by lectures, demonstrations, schools, demonstration cars, study clubs, bulletins, reading courses, and the press. With the exception of the publications, the greater part of these activities have been conducted in cooperation with the farm and home bureaus, especially in the twenty-five counties and two cities having home bureaus.

The demonstrations, the schools, and, to a less degree, the lectures, were almost all conducted in cooperation with home bureaus.

In nutrition and foods 124 lectures were given, with an attendance of 6453 persons, and 20 child-feeding projects, 3 clinic demonstrations, and 16 five-days schools, were conducted. This work was done in 23 counties. The nutrition schools are meeting a real need in the community, and are far more satisfactory than the one-day meetings. One clinic demonstration has been continued as a definite piece of work.

In the extension teaching in clothing, 21 five-days and 3 three-days schools have been held. In addition to this instruction 108 demonstrations and lectures have been given, with 1068 persons in attendance. The clothing work was done in 33 counties.

In hygiene and sanitation, the work in which was begun after January 1, lectures have been given before a number of granges, women's clubs, and church organizations. As a result it has been recommended that health surveys be made in cooperation with home bureaus, boards of health, and other bodies, and that more intensive health work, based on the results of these surveys, be undertaken. An eight-page health bulletin has been completed and short articles on household sanitation have been prepared for the use of the daily papers in the State. Lists of reference books and pamphlets have also been prepared for the general use of county agents, and special bibliographies have been supplied on request. The aim of the work, both in lectures and in publications, has been to arouse interest in personal and community health and to create a desire for reliable information.

The "Victory Special," operated for 63 days, reached 12,358 persons in 22 counties.

Home bureau activities. In the counties and cities in which there are home bureaus, the communities organized for home bureau work determine, in conference with the home bureau manager and representatives from the State College, a project or a program applicable to the community conditions. The county-wide program adopted by the executive committee is made up from these individual community programs.

The following projects have been adopted and worked upon in the different communities throughout the State in the past year: clothing, junior work, labor-saving methods or devices, health, community activities. Communities have promoted community kitchens, sewing rooms, cooperative buying, day nurseries and children's play-grounds, home bureau tours, rest rooms, women's exchanges, recreation and recreational centers, community libraries, and community houses. For the working out of these programs 4466 meetings and demonstrations have been held, with a total attendance of 213,185.

The central office of home bureaus has been organized to cooperate with the executive committees in the development of this work. The State leaders have attended 361 meetings with a total attendance of 18,673.

Junior extension clubs. The most important activity of junior projects in homemaking has been the training of local leaders of clubs. Illustrated talks at teachers' conferences, and before small groups of interested persons such as school officials and home bureau members, have been given, and meetings with girls' clubs have helped them in formulating their year's program.

The plan of organizing girls into groups and of having each group directed by a local adult leader has proved good, as shown by the large number of projects completed and the excellent grade of products turned out, by the letters and special reports that have come to the specialists, by the demonstrations given by girls at school and county fairs and at the State Fair, and finally by the extension of the work from a small group to larger and larger groups by the local leaders and by the workers who come under the instruction of the specialists. This junior work has reached directly 3279 persons in 148 meetings, and, in addition, has resulted in the training of 30 groups of leaders and the giving of 76 demonstrations in foods, canning, and clothing.

Reading Course for the Home. During the year, 5554 new names have been added to the mailing list for reading-course lessons, which now contains 61,646 names. In addition, these publications are sent to the study club list of 2926 names and to a list of institutions and professional readers numbering about 2500.

Since July 1, 1919, 9031 individual requests for publications have been filled, 2499 of which came from outside the State. These were in addition to bulletins in quantity sent to home demonstration agents and others.

Cornell study clubs. There are now 107 Cornell study clubs, located in 31 counties and having a membership of 2926 women. Of this number, 25 clubs, with a membership of 808, were not organized originally for the study of home economics, but they have asked to have the material prepared for the Cornell study clubs sent to them. Programs have been prepared and distributed on the following subjects and in the following numbers: thrift, 20; health, 20; civics, 22; foods and nutrition, 6. The correspondence includes 1001 letters and 11 circular letters written to clubs. Thirty clubs have been visited by the study club leader.

Preparation of news. In October, 1919, the preparation of news matter on home economics, to be issued through the Office of Publications of the College, was made the work of one member of the extension staff. As this has developed, it has included the contribution of articles to the state press, to the Extension Service News, to the Farm and Home Bureau

News in various counties, and to farm papers. Contributions are also made regularly to the National Grange Monthly. Since January, 1919, a monthly collection of news material has been sent to home bureau agents and others, to keep them in touch with current information.

A quarterly leaflet, *The Home Economics Reminder*, has been mailed to former students and to home economics workers associated with the College.

During the year 96 articles, containing a total of 383 pages, have been sent out, and 170 letters have been written. The extension instructor in charge of this work has spent 41 days in the field, and has given 11 lectures with a total attendance of 756. In addition 14 conferences have been attended, with a total attendance of 124 persons.

Miscellaneous activities. Miscellaneous activities of the School during the past year include the operation of a community canning kitchen in Ithaca; milk demonstrations and exhibits at the county fairs and at the State Fair, and participation in the New York Milk Show. In all, 44,359 persons were reached by extension activities in this field — 22,431 through lectures, 19,725 by demonstrations, and the remainder by conferences.

Landscape Art

The extension activities of the Department of Landscape Art are becoming important in countryside development and improvement. The purpose is primarily educational. The home, the school, and the community should be livable as well as workable, and they cannot be truly satisfying unless they are attractive as well as efficient.

Data for this extension work are gathered by means of surveys and studies. The actual needs are discovered, and a sound policy on which to base recommendations is established. During the past year such surveys have dealt with farm homes and rural schools.

Information is given by means of correspondence, lectures, demonstrations, printed matter, and exhibits. Exhibits this year during Farmers' Week at the University, and at the State Fair at Syracuse, conclusively proved their worth. The increase in volume of correspondence over last year was more than 100 per cent. Nine articles have been mimeographed this year, with a distribution of approximately 4300 copies. Calls for assistance from individuals, communities, and farm bureau workers have increased rapidly.

Meteorology

In the past, little has been done in the field of extension by the Department of Meteorology. This year, in addition to supplying lecturers for various meetings in the State, the department is cooperating with the

Tompkins County farm bureau agent in furnishing local weather forecasts to interested farmers of the county.

Plant Breeding

The extension work of the Department of Plant Breeding has been conducted principally by one member of the staff, who at the same time has handled many of the experimental tests which are being made away from the College. Demonstration plantings have been made, and community demonstration meetings held in connection with them, as follows: oats, 17 plantings in eight counties; wheat, three counties; barley, two counties; rye, three counties; corn, six counties; timothy, one county.

Considerable effort has been devoted to other activities, such as inspection of seed fields, conferences with county agents, judging at fairs, attendance at community meetings, and participation in the work of the seed cars.

Plant Pathology

The demands for extension in plant-disease control have increased markedly during the past year. The most urgent problems in the State appear to be in connection with the diseases of seed potatoes, seed corn, vegetable crops, and fruit.

Seed treatment for the control of certain tuber-borne diseases of potatoes was conducted on an extensive scale during the spring in most of the potato-growing sections, under the supervision of special field assistants and graduate students in the Department of Plant Pathology. The results of demonstrations on this project show that substantial progress has been made in generalizing the practice among potato growers in this State.

A preliminary survey of the root rot of seed corn, both on Long Island and upstate, shows a serious situation. Much of the seed used in the State appears to be badly infected, as shown by examination of the seed and confirmed by field conditions. An agreement with the Suffolk County cooperative association provides for a survey, and a program of control.

The demand for special field service in the control of diseases and pests of fruit and vegetable crops is being met by placing special field assistants in the counties which request such service. The Departments of Plant Pathology and Entomology, cooperating in this project, have placed eight such assistants in as many counties this spring, working through and with the farm bureaus, the College providing \$50 a month for six months and the special supervision of trained extension specialists, and each farm bureau furnishing \$100 salary a month for six months — a total of \$150 salary a month for each assistant. The farm bureaus also provide

and maintain cars for the use of the field men. In three other counties a similar arrangement, using the services of the farm bureau assistant for the growing season, is in operation, the farm bureaus providing all the salary. Dr. H. E. Thomas has joined the college staff as special field supervisor of these men on fruit diseases, while Dr. Charles Chupp and Dr. H. W. Dye have supervised the work on field crops and vegetables. A steady growth in the demand for this type of extension service is foreseen, and adequate provision for its needs should be anticipated.

Other extension activities of the department may be briefly summarized as follows: extension schools attended, 34, with a total attendance of 944 persons; farm bureau community meetings attended, 33, at which 934 persons were reached, largely in connection with potato diseases; letters written in reply to special inquiries during the year, 2368; special leaflets giving information on diseases and their control, sent out on request only, 105,174 copies.

Pomology

Three principal lines of work occupied most of the time of the extension specialists in the Department of Pomology—central packing houses, pruning demonstrations, and bridge-grafting demonstrations. Orchard renovation, pollination, cover crops, fertilizers, and judging at fairs, also received some attention. The demands for work in this field are growing rapidly.

The movement to organize central packing houses has been encouraged by giving information as to what has been done by other packing houses in the State; and a general plan for organization, buildings, equipment, and operation has been formulated through twenty conferences held with packing-house groups and prospective organizations.

Seventy-eight pruning demonstrations have been given during the year.

Following a winter of severe mice injury to young trees, there was an unusual call for bridge-grafting demonstrations, and twenty-two of these were given.

Correspondence has been heavy. In addition, 91 lectures, 55 inspections, 16 conferences, and 10 days at exhibits, have given instruction in general fruit culture. This was further supplemented by the farmers' institute lectures in pomology.

Poultry Husbandry

The extension program in poultry husbandry includes culling to eliminate undesirable birds; certification of the best birds for breeding purposes; improvement of flocks by the distribution of Cornell pedigree

cockerels and Cornell pedigree chicks; and the Cornell advanced registry for officially recording superior birds.

Practical results from the 451 lectures and demonstrations held in 1919-20, with 16,463 persons in attendance, the 96 days spent with exhibits, and the 683 farm visits, include not only an increased and more intelligent interest in poultry husbandry, but also, more specifically, the pledging of 305,975 fowls for selection, and the certification of 13,628 others on 164 farms in 40 counties with an estimated saving of \$138,263.30 to the owners.

Rural Engineering

Special emphasis has been placed by the Department of Rural Engineering during the past year on its extension demonstration schools, in which particular attention has been given to the gasoline engine. Engine efficiency is proportional to the skill and knowledge of the operator, other things being equal.

Tractor schools, successfully conducted for the past two years by the New York State Food Commission, were taken over this year by this department. Four have been held, one each at Rochester, Buffalo, Gouverneur, and North Rose. The average attendance was 50.

The following extension schools have been conducted: Twelve three-days gas-engine schools, with an average attendance of 28.2; five three-days milking-machine schools in cooperation with the Department of Dairy Industry, average attendance 23; four farm-mechanics schools in cooperation with other departments, average attendance 29; two special schools, one at Alfred with an average attendance of 25, and one at Columbia University with an average attendance of 20. Aside from these schools, members of the department have conducted 23 single-session meetings on special subjects, such as the tractor, lighting plants, the effect of the gas engine on eastern agriculture. The total attendance at these sessions was 1371.

The work in cooperation with the State Department of Farms and Markets, in planning drainage systems for the state-owned ditchers, has been continued. This work shows tangible results from a practical standpoint, and has educational value throughout the community. Members of the department have answered many calls for assistance on especially difficult drainage problems. In all cases the aim is to give this work a demonstrational value for other farmers, in addition to the individual benefit to those directly interested. The drainage of large muck areas has been continued.

Two assistant professors, A. M. Goodman and F. G. Behrends, have been added to the extension staff in the past year. The loss of Assistant

Extension Professor W. K. Blodgett through his resignation, which took effect on January 1, 1920, has been keenly felt.

Rural Social Organization

No systematic extension work has been attempted by the Department of Rural Social Organization, but addresses have been delivered at community meetings and some advice has been given through correspondence. A thorough study has been made of the best methods for work in rural organization and a project for extension work has been prepared.

Soil Technology

Demonstration work with soils has been somewhat reorganized with the idea of simplification. All demonstrations are now grouped under five subprojects. Two of these deal with the use of lime, one emphasizing its need on New York soils and the other comparing different forms and quantities of this material as a soil amendment.

Two hundred of these new lime demonstrations were planned in 33 counties of the State for the growing season of 1920. Because of delayed deliveries of lime, not more than one-half of these projects were started with spring crops. In addition to these new lime projects, a hundred or more of those established in 1918 and 1919 have been continued this year.

A project emphasizing the importance of phosphorus in soil utilization, and permitting of a comparison of different phosphatic materials as well as of acid phosphate with a mixed fertilizer, was outlined for this season. Twenty-five counties expressed their desire to establish this demonstration. A subproject demonstrating the proper treatment of the various soils of the State has also been outlined. This project has been established in several counties and will be taken up in others as rapidly as satisfactory cooperators can be found.

Another project, planned to emphasize the need of lime by means of a lime survey, has been started in five counties.

Lectures including extension schools, community meetings, farmers' institutes, and a few special assignments, have dealt largely with fertilizer and lime problems. Emphasis has been placed on the economic purchase of fertilizers, the importance of acid phosphate or other standard phosphatic materials for field crops, the value of farm manure and its proper utilization, and the relation of systematic liming to the improvement of the less productive soils of the State. Ten extension schools have been attended, covering a total of 35 days. Seventy-one additional lectures have been given, with a total attendance of 1774.

Besides the regular correspondence with farmers, special attention has been given to requests for expert advice from the various county managers.

Articles have been furnished regularly to the press and to the Farm Bureau News of the State through the Office of Publications. An attempt has been made to keep all farm bureau offices fully informed as to current fertilizer prices. A large number of soil samples have been examined and specific recommendations made for their future treatment.

Vegetable Gardening

Commercial vegetable growing, and school and home gardening, have been given attention by the Division of Vegetable Gardening during the year. One man devoted all of his time to school and home gardening; another devoted about two-thirds of his time to extension work in commercial gardening, and the remainder to tomato survey work.

In commercial gardening the main effort consisted in helping the county agents to arouse interest in demonstration work, through personal visits, conferences, and meetings. During the spring of 1920, demonstrations were started in most of the principal vegetable-growing counties. The most important of these were variety and strain demonstrations on tomatoes, cabbage, cauliflower, celery, and onions; plant-grading demonstrations on tomatoes, cabbage, and cauliflower; fertilizer and green-manure demonstrations on tomatoes; and fertilizer demonstrations on celery, lettuce, and onions grown on muck soils.

Assistance was given in the organization of county canning-crops associations and of a state canning-crops association with a membership of about 4000.

In school and home gardening extension, the main effort for the first three months of 1920 was the training of teams for demonstrations at fairs, and the supplying of subject-matter information to school-garden and crops-club leaders. Since January 1, 1920, the main work has been furnishing information to leaders through personal conferences, meetings, news articles, circular letters, and other means.

Recommendations

The past few years in extension work have constituted a period of growth. The work has not yet reached its highest development, but the time has come when it must be stabilized and coordinated. The specialists and the field forces need to be aligned more closely; the work should be limited to its proper sphere of teaching agriculture and home economics, and the organization should be so correlated as to reach a larger number of persons at less cost. This can be accomplished in part by the giving of advanced instruction to local leaders.

The quality of instruction must be improved to make it of maximum effectiveness. Special need exists for the increased use of illustrative

material, in the use of which many extension teachers are deficient. All the means of extension teaching — publications, lectures, demonstrations, exhibits, conferences, and the development of a real leadership by specialists and by the local workers — must be jointly developed.

The problem of the completion of the extension system still remains. Home demonstration agents are yet to be established in more than thirty counties. This will be done as fast as each new county is ready to cooperate in the maintenance of an agent. More than forty counties are still without junior extension leaders. Before the work in this field can be considered adequate, these leaders must be provided. The specialist service is not yet fully rounded; more specialists are needed in marketing, distribution, and economic problems, in dairying, in poultry husbandry, in animal husbandry, in rural organization, in plant diseases, in floriculture, in rural art, and in home economics. Additional finances must be provided either from federal or from state sources. The State and the Nation should feel and accept the obligation to complete the system which has been started and which has fully justified itself.

Difficulties are still found in obtaining trained and competent persons for extension service. To meet this need, courses in the College for the training of extension workers, especially county agents, should be made more complete. Students should be shown the advantages of work in this field.

The relocation and reorganization of the extension offices and office equipment to bring about a closer and more efficient physical and administrative relationship, reduce the overhead cost to a minimum, and provide for the most effective work, is urgent. Inadequate facilities extend throughout the Extension Service, and the best work will not be possible until adequate quarters and equipment are provided.

An additional helper in the editorial office to act as emergency editor on regular publications, and to prepare special material for the agricultural press of the State, is sorely needed. Publications are seriously delayed by the lack of editors. A further need in the Office of Publication is for a definite appropriation for the advertising of Farmers' Week in the winter and Farmers' Field Days in the summer. Such a fund should be available, also, to bring adequately to the people of the State, through the press, the advantages of the short course and the four-years course in agriculture.

THE RESEARCH ACTIVITIES

The legislation known as the Hatch Act, appropriating to the States funds to assist in the maintenance of agricultural experiment stations, was passed by Congress in 1887. In 1889 Cornell University was designated as the college entitled to receive the benefits of the act for New

York, and in 1894 the law was amended so that the New York Agricultural Experiment Station at Geneva should receive one-tenth of the funds. In 1906, by the Adams Act, additional federal funds were made available to the States for agricultural research. This grant was accepted by the New York Legislature in the same year, and the funds were applied to the maintenance of the Cornell University Agricultural Experiment Station and the New York Agricultural Experiment Station in the same proportion as the funds appropriated by the Hatch Act. In the Administration Act passed by the New York Legislature in 1906, the conduct of research is prescribed as one of the three coordinate lines of activity to be undertaken by the College.

The two institutions at Ithaca and Geneva are thus made jointly responsible for the solution of difficult agricultural problems. Accepting the responsibility, they have cooperated to avoid duplication of effort and to insure the best service. The State thus has one experiment station separated from teaching activities, where the workers, having no other responsibility than experimentation, may develop the best of experimental work habits; and another in which the activities of the workers may not be so concentrated, but in which the perspective is modified by the repeated organizing of subject matter for presentation to advanced students. It would seem that the two institutions might very effectively supplement each other in working out intricate and diverse agricultural problems. The possibilities of this have been materially furthered by the affiliation of the two stations, referred to elsewhere in this report.

The value to the State of an experiment station separated from all other activities cannot be questioned. The results obtained by the New York Agricultural Experiment Station at Geneva are of a high order, and the Station stands second to none as a leader in its field. The concentration on research and the comparative freedom from interruption have been productive of excellent work. There are many reasons, however, why an experiment station associated with the agricultural college is also necessary. The great need for more nearly complete knowledge concerning the fundamental nature of plant and animal responses and the laws of economics as applied to agriculture, would seem to justify the view that in the system of agricultural education the interests of sound research should have first consideration.

For the greatest development of research the aid of the teacher is required. In his efforts to better organize his subject, many problems will present themselves to the progressive teacher which might never come to the attention of one who works in research alone and who, by being separated from teaching activities, is not called upon to organize his subject critically. Not to give these men the equipment necessary

to conduct investigations on such problems is to greatly delay the development of a dependable system of agricultural knowledge. Furthermore, it is not easy to select men who will prove to be productive in research. Generally, among many, a few will prove especially effective.

Obviously, then, the larger the number of men in close touch with experiment stations, the greater will be the possibility of finding those who are peculiarly adapted to research efforts. If the large number of highly trained men necessary for teaching have not such equipment as an agricultural experiment station furnishes, many of great promise in research may never be permitted to discover their powers. If agricultural problems are to be solved, a constant stream of highly trained young men to enter upon research activities must be provided. These men must be trained at the colleges; if their teachers understand from actual experience the methods and difficulties of research and are animated by its spirit, young men with great possibilities for research will have their interest directed to it.

The experiment station is of great value to the college for its influence on undergraduate teaching. The research spirit is essential to the best teaching in any form of higher education. In an agricultural college it is peculiarly essential, because of the incompleteness of agricultural knowledge. In no agricultural subject are the resources of fact so complete that the teacher can give to his students a system of practices and be certain that all of those practices are, under all probable conditions, the best. The student in the classroom is thus repeatedly encountering unsolved problems, and he will encounter them after he leaves college. He must therefore be taught to evaluate the experimental evidence concerning the wisdom of different practices, not only in order that he may reach intelligent conclusions from the standpoint of evidence that is available when he is in college, but also that in his planning he may properly relate his own experiences after leaving college and new experimental evidence as it may appear.

It would seem undeniable that such a spirit of research could not be developed in students by teachers who do not have their own spirit of research constantly renewed and intensified by being associated with the conduct of research. It may fairly be maintained that the experiment station is the most vital feature in the system of agricultural education. It is not merely a continuing source of new truth, but also an effective agency in keeping alive in an institution the spirit of research — that attitude of mind which patiently examines the evidence before reaching a conclusion and is as essential to the honest presentation of truth as to its discovery.

The following is a brief report of the research activities of the different departments during the fiscal year 1919-20:

Agricultural Chemistry

In the Department of Agricultural Chemistry the following paper has been published:

F. E. Rice — Milk with high apparent acidity. *Science* 50:424. 1919.

Individual cows were found giving milk with titratable acidities as high as 0.22 per cent. Formaldehyde titration indicated that where high casein was present high apparent acidity might be expected, although casein was not high in all cases of apparent high acidity. Titration by the Van Slyke oxalate procedure indicated that phosphates were always somewhat higher in this class of milk. Observations did not indicate that feeds were a factor in causing high apparent acidity.

The following paper is ready for publication:

F. E. Rice — A new conductivity cell.

The following work is under way:

G. W. Cavanaugh — Chemical studies of dairy wastes.
Mineral constituents of cattle feed.

F. E. Rice — Use of the apparatus for electrometric hydrogen ion determination as applied to milk and milk products.
The preservation of apple cider and other fruit juices.
A study of the organisms of sweetened condensed milk.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management the following papers have been published:

J. E. Boyle — Collective bargaining in agriculture. *Amer. Assoc. Agr. Legislation*. Bul. 6:35-47. 1920.

This paper gives attention to the theory of collective bargaining and to its limitations and dangers. The experience in collective bargaining of a considerable number of groups of farmers is given.

Solving the problems in the new field. *Univ. North Dakota. Quart. Journ.* 1920:329-335. 1920.

H. D. Phillips — Cooperative marketing in the Chautauqua-Erie grape industry. *Cornell Univ. Agr. Exp. Sta. Mem.* 28. 1919.

This memoir gives a rather minute history of the grape industry in the section considered, with particular reference to experiences in cooperative marketing. The difficulties encountered are reported from careful studies in the locality. Two general kinds of marketing organizations have been tried in the region: one, the small local type, and the other, the large central, or belt-wide, organization. The advantages and difficulties of both types are discussed.

G. F. Warren — Prices of farm products. *Journ. farm economics* 2:61-69. 1920.

This paper discusses the reasons for general high prices, and for the especially high prices of particular commodities. The question as to how long prices may remain high is considered.

T. I. Myers — An economic study of farm layout. *Cornell Univ. Agr. Exp. Sta. Mem.* 34. 1920.

This paper reports the results of a study of the layouts of fifty-three New York farms, the object being to trace the development of farm layouts, to study

Plans are included illustrating different stages in the actual rearrangements of some New York farms as made by owners, and possible rearrangements of other farms which have been started but are not yet completed. These plans are accompanied by descriptions of the farms, of local conditions, and of the procedure followed in carrying out the plans for rearrangement.

The following papers have been mimeographed as a temporary report of studies being carried further:

The following papers are ready for publication:

The following work is under way:

Animal Husbandry

M. W. Harper — Raising colts.

F. M. Fronda — Protein supplements for coconut oilmeal.
M. W. Harper (in cooperation with the United States Department of Agriculture)
— The value of fish scrap as swine food.

- E. S. Savage and L. A. Maynard — The rearing of calves on substitutes for skimmilk.
G. Toupin — The relation of amounts of vitamins in animal food to milk production and to the amount of vitamins in the milk.
H. H. Wing — Breeding work with dairy cows.

Botany

In the Department of Botany the following papers have been published:

- O. F. Curtis — The upward translocation of foods in woody plants. I. Tissues concerned in translocation. Amer. journ. bot. 7:101-124. 1920.

The view has been held that carbohydrates move upward in the tree through the xylem. The author of this paper removed rings of bark from branches and removed the leaves above the rings. Analyses of the tissues above and below the rings were made, and both starch and sugar were present above the rings in greatly reduced quantities, if at all, until a new leaf surface had been formed. Even at the top of a ringed space a centimeter wide there was little or no starch in the sapwood tissues, though in the lower part of the ringed space starch might be present. When two rings were made on the same stem, one some distance above the other, the concentration of sugar in the xylem was much greater between the rings than above the upper one or below the lower one. It seems, then, that the sugar must be removed from the xylem in passing a strip a centimeter wide where the bark has been removed. This seems to show that upward translocation of carbohydrates is through the phloem.

- M. R. Ensign — Venation and senescence of polyembryonic citrus plants. Amer. journ. bot. 6:311-329. 1919.

Since it is apparently established that with some citrus species in which there are more embryos than one in a seed, one embryo is from the fertilized egg while the others arise from other tissue, the author of this paper thought that the seedling arising from the fertilized egg might show a greater rejuvenescence than the others, which in origin are more like plants from vegetative propagation. He used as a measure the size of vein islets as used by Benedict and the nucleocytoplasmic ratio in the root-cap cells. No differences were found among the seedlings, though some must have arisen from the fertilized egg and others from other tissue. The author holds that rejuvenescence is not more effectively brought about by sexual than by apogamous reproduction.

- L. Knudson — Viability of detached root-cap cells. Amer. journ. bot. 6:309-310. 1919.

Root-cap cells of corn were alive at least forty-five days, and those of Canada peas at least seventy-one days, after they had been sloughed off into a sterile culture medium.

- L. Knudson and E. W. Lindstrom — Influence of sugars on the growth of albino plants. Amer. journ. bot. 6:401-405. 1919.

Albino plants grown in Pfeffer's solution to which was added glucose or sucrose enough to make the solution 0.1 mol. or 0.2 mol. for sugar alone, while making slightly more growth than plants not receiving the sugar, yet made only slight growth before dying — seldom enough to equal the original seed weight. Chlorophyll-containing plants under the same conditions made considerably increased growth when sugar was supplied in the culture solutions.

- L. Knudson and R. S. Smith — Secretion of amylase by plant roots. Bot. gaz. 68:460-466. 1919.

From work with plants in pure culture the conclusion is suggested that neither *Zea mays* L. nor *Pisum arvense* L. is capable of utilizing soluble starch, and that with neither is there an appreciable secretion of amylase by the roots.

- D. Reddick and V. B. Stewart — Transmission of the virus of bean mosaic in seed, and observations on the thermal death point of seed and virus. Phytopathology 9:445-450. 1919.

Evidence is presented to show that the virus of bean mosaic is transmitted in the seed. Thus, seeds with the surfaces sterilized, either by washing in bleach-

ing powder, by washing in other sterilizing agents, or by heating to 70° C., in so far as they germinated produced plants a high percentage of which were infected. Experience indicated that the disease is not readily communicated from one plant to another.

L. W. Sharp — Spermatogenesis in *Blasia*. Bot. gaz. 69:258-268. 1920.

Some detailed observations on the origin of the male cell (spermatozoid) in *Blasia*, a liverwort, are given in this paper. Centrosomes were found present in *Blasia* at all stages of the mitosis which differentiates the androcytes. In the androcytes they were found to persist and function as the blepharoplasts. In the transformation of the androcyte into the spermatozoid, the blepharoplast fragments repeatedly by simple fission, forming a number of distinct granules which coalesce to form a short, lumpy rod. This rod elongates and becomes a more uniform thread bearing two cilia, while the nucleus also elongates in intimate union with it to form the body of the spermatozoid. The present instance is the first in which blepharoplast fragmentation has been reported in a bryophyte.

F. B. Wann — Fixation of free nitrogen by green plants. Science 51:247-248. 1920.

Seven species of grass-green algae were tested as to their ability to fix free nitrogen. All seven species seemed to show considerable ability to fix nitrogen when a small amount of glucose was present in the medium and when a definite amount of combined nitrogen was furnished in the form of ammonium nitrate or calcium nitrate.

K. M. Wiegand — Variations in *Lactuca canadensis*. Rhodora 22:9-11. 1920.

This is a study showing that forms of the wild lettuce usually ascribed to three species are simply leaf-variations of the same species due to environmental or inherent causes.

A new species of *Spergularia*. Rhodora 22:15-16. 1920.

The sand spurreys are salt-marsh plants but they occur also around salt springs in central New York. Those from near Montezuma and Savannah are unlike anything ever discovered elsewhere, and constitute a new species.

Eupatorium purpureum and its allies. Rhodora 22:57-70. 1920.

This is a study of the joe-pye weeds of eastern North America, showing that instead of these belonging to a single species there are actually four, and giving new means of recognizing them. Characters derived from the small florets were found especially useful.

The following papers have been prepared for publication:

E. Artschwager — On the anatomy of *Chenopodium album* L.

Studies on the pathological anatomy of potato blackleg.

O. F. Curtis — The upward translocation of foods in woody plants. II. Is there normally an upward transfer of storage foods from the roots or trunk to the growing shoots?

L. Knudson — Invertase secretion by roots of plants.

L. W. Sharp — Somatic chromosomes in *Tradescantia*.

K. M. Wiegand — *Echinochloa* in North America.

Additional notes on *Amelanchier*.

The following investigations are under way:

E. Artschwager — Studies on leaf roll diseases.

A. R. Bechtel — Anatomy of the flowers of the *Urticaceae*.

J. M. Brannon — Function of fructose and glucose in plants.

O. F. Curtis — Researches on conduction in plants.

Growth correlation in plants and inhibition of growth.

A. J. Eames — Anatomy of the Ranalian flower.

A. J. Eames and M. J. Fisher — Anatomy of the flowers of the *Salicaceae*.

H. E. Knowlton — Pollen viability.

L. Knudson — Organic nutrition of plants.

Orchid seed germination.

Enzyme production and fixation.

R. S. Nanz — Nitrogen fixation by legumes.

- L. F. Randolph — Development of chondriosomes in relation to plastid inheritance in corn.
- D. Reddick — Various phases of the bean mosaic problem.
Conditions of parasitism in maize.
A fourth *Phytophthora* disease of tomato.
- L. W. Sharp — Studies on chromosome reduction.
- F. B. Wann — Studies on the fixation of nitrogen by green plants.
Chromosome numbers in corn and development of embryosac.
- K. M. Wiegand — North American species of *oxalis*.
Bromus ciliatus, *B. secalinus*, and their allies in North America.
Rudbeckia laciniata in North America.
Aster paniculatus and its allies in North America.
- K. M. Wiegand and A. J. Eames — A catalogue and manual of the flora of the Cayuga Lake Basin.

Dairy Industry

In the Department of Dairy Industry the following papers have been published:

- R. S. Breed and W. A. Stocking — The accuracy of bacterial counts from milk samples. New York (Geneva) Agr. Exp. Sta. Tech. bul. 75. 1920.
This publication gives the results of work conducted by the Department of Dairy Industry at Cornell and the Division of Bacteriology of the New York Agricultural Experiment Station at Geneva, primarily for the purpose of learning the best methods for determining the germ content of milk. This subject is of special importance at the present time because of the growing practice of using the germ content as a factor in determining the sale value of milk.
- J. T. Cusick — Phosphorus in butter. Cornell Univ. Agr. Exp. Sta. Mem. 30. 1920.
This paper gives the results of a technical study of the amount of phosphorus in butter, especially in its relation to the development of fishy flavor. The author found that, in churning, about one-fourth of the phosphorus of the cream is retained in the butter. In storage the soluble organic phosphorus breaks down, giving inorganic phosphorus. The rate of this change is influenced by the treatment of the milk and cream before churning. The breaking down of one of these compounds, lecithin, to trimethylamine is the cause of fishy flavor in butter.
- N. W. Hepburn — A modified Babcock method for determining fat in butter. Cornell Univ. Agr. Exp. Sta. Mem. 37. 1920.
This memoir reports an effort to find a simple but accurate method of determining fat in butter. The 9-inch, 9-gram, 90-per-cent bottles and the 6-inch, 6-gram, 90-per-cent bottles were found to be the most satisfactory types. From the standpoint of manipulation, the 9-inch, 9-gram bottle, permitting of a larger sample and better-spaced graduation, is the more desirable type. Such bottles, of course, can be used with the ordinary Babcock machines. A method is outlined for taking samples and preparing them for use in these bottles in the Babcock apparatus, by which, with 124 samples, results were obtained corresponding very closely to the results obtained by chemical analysis.
- T. J. McInerney and H. C. Troy — A comparative study of some methods for determining the fat content of skimmilk. Cornell Univ. Agr. Exp. Sta. Bul. 401. 1920.
This bulletin reports modifications of the Babcock method, which make possible more accurate results in determining the percentage of fat in skimmilk.
- G. C. Supplee — The lecithin content of butter and its possible relationship to the fishy flavor. Cornell Univ. Agr. Exp. Sta. Mem. 29. 1919.
The data given in this memoir indicate that there is in normal butter a sufficient amount of lecithin to yield on decomposition small quantities of trimethylamine, which substance is essential for the manifestation of the fishy odor. It is not considered, however, that the cause of the fishy flavor is satisfactorily established. A certain acid condition in the butter is essential, and also the presence of certain organisms.

H. C. Troy — A comparison of fat tests in milk as determined by a cow-testing association and by a creamery. Cornell Univ. Agr. Exp. Sta. Bul. 400. 1920.

This bulletin reports a study of the records of a cow-testing association and the tests of the milk from the same farms as it was delivered to the local receiving station. For some time the lack of agreement between such records has caused difficulty in some parts of the State. The results given in this study indicate that an exact comparison of the tests made by a cow tester and those made at the receiving station should not be expected, as there are so many factors which may very materially influence the relation between the two series of tests.

The following papers are ready for publication:

P. A. Downs — Bacterial flora of powdered milk.

G. C. Supplee, W. A. Whiting, and P. A. Downs — The influence of media and temperature on the plate count.

The following work is under way:

W. W. Fisk — The effect of washing curd on the yield and quality of cheddar cheese. Relation of moisture and acidity to keeping quality of neufchatel and cream cheeses.

Factors affecting the formation of ice crystals in ice cream.

The effect of clarifying milk for making cheddar cheese.

Pasteurization of milk for cheese making.

The manufacture of Camembert, Swiss, and albumen cheeses.

E. S. Guthrie — Study of dairy plant records.

H. C. Jackson — The effect of neutralization on the quality of butter.

T. J. McInerney — Study of city milk supply.

Acidity of fresh milk.

H. E. Ross — Shipments of dairy products in New York State.

W. A. Whiting — Species of bacteria found in dairy utensils.

Entomology

In the Department of Entomology the following papers have been published:

C. P. Alexander — The crane-flies of New York. Part II. Biology and phylogeny. Cornell Univ. Agr. Exp. Sta. Mem. 38. 1920.

L. A. Hausman — The manipulation and identification of the free-swimming Mastigophora of fresh waters. Amer. nat. 54:333-348. 1920.

G. W. Herrick — The apple maggot in New York. Cornell Univ. Agr. Exp. Sta. Bul. 402. 1920.

This bulletin reports the results of experiments which clearly demonstrated that the apple maggot can be controlled by timely spraying with arsenate of lead, sweetened or unsweetened.

The winter of 1918-19 and the activities of insects with special reference to the clover leaf-weevil. Ent. Soc. Amer. Ann. 13:101-107. 1920.

The author's studies indicate that in the climate of central New York the clover leaf-weevil may survive during very mild winters and deposit eggs in the spring, thus producing a second generation.

W. N. Hess — The ribbed pine-borer. Cornell Univ. Agr. Exp. Sta. Mem. 33. 1920.

This memoir reports a study of the life history, economic importance, and means of control of the ribbed pine-borer.

Robert Matheson — A study of the plant lice injuring the foliage and fruit of the apple. Cornell Univ. Agr. Exp. Sta. Mem. 24. 1919.

This paper gives an exhaustive survey of the literature, together with the results of an extensive study of the life history and behavior, of the insects considered.

- J. G. Needham — Burrowing mayflies of our larger lakes and streams. Bur. Fisheries. Bul. 36:269-290. 1920.

This is a discussion of the economic importance and the habits and classification of the insects treated.

The following papers are ready for publication:

- Hazel E. Branch — Internal anatomy of Trichoptera.
 P. W. Claassen — Typha insects: their ecological relationships.
 E. H. Dusham — The painted hickory borer.
 Laura Florence — The hog louse.
 W. T. N. Forbes — The Lepidoptera of New York and the neighboring States.
 H. H. Knight — Studies of the scarring of apples by insects.
 J. T. Lloyd — Life histories of North American caddis flies.
 C. F. W. Muesebeck — A revision of the North American species of ichneumon flies belonging to the genus *Apanteles*.
 Helen E. Murphy — Metamorphosis of mayfly mouth parts.
 Chih Ping — The biology of *Ephydra subopaca* Loew.
 R. C. Smith — The biology of the Chrysopidae.
 W. H. Wellhouse — The insect fauna of the hawthorns (*Crataegus*) and its relation to the apple orchard.
 B. P. Young — The attachment of the abdomen to the thorax among Diptera.

The following work is under way in the department:

- P. W. Claassen and Hazel Branch — A biological study of *Chironomus cristatus* and its relation to the disposal of milk waste.
 J. D. Detwiler — Three little-known pests of clover.
 Repugnatorial organs in notodontid caterpillars.
 I. M. Hawley — Insect and other pests of beans.
 G. W. Herrick — Some late summer caterpillars of the apple.
 G. W. Herrick (in cooperation with the New York Agricultural Experiment Station at Geneva) — Experiments in the control of the apple and cherry maggots by dusting.
 H. C. Hockett — Morphology of the ovipositor in the Anthomyiidae.
 O. A. Johannsen — Parthenogenesis in certain dipterous insects.
 Helen G. Mank — A contribution to the knowledge of Staphylinidae.
 R. Matheson — A study of *Tetrastichus asparagi*, an important parasite of the asparagus beetle (*Crioceris asparagi*).
 Insect vectors of plant diseases.
 C. F. W. Muesebeck — Preparation of a host list of parasitic Hymenoptera.
 Artificial biological control of certain injurious insects.
 C. F. W. Muesebeck and R. Matheson — Rearing of local injurious insects to determine the parasitic forms that are factors in their natural control.
 J. G. Needham and P. W. Claassen — Studies upon neuropteroid insects.
 J. R. Traver — The life history of the black-nose dace (*Rhinichthys atronasus*).
 R. L. Webster (in cooperation with the New York Agricultural Experiment Station at Geneva) — A study of the fumigation with hydrocyanic acid gas of deciduous fruit trees to control certain insect pests.
 L. P. Wehrle — Insects affecting the seed of the clover plant.

Farm Crops

In the Department of Farm Crops the following papers are ready for publication:

- E. V. Hardenburg — A study by the crop survey method of factors influencing the yield of potatoes.
 R. G. Wiggins — A classification of the cultivated varieties of barley.

The following work is under way:

E. V. Hardenburg — Variety tests of beans and potatoes.

Strain tests of standard varieties of potatoes for different sections of New York State.

H. S. Mills (in cooperation with the Department of Farm Management) — A canning crops survey with reference to production cost and cultural methods.

E. G. Montgomery — Studies as to the best treatment and the value of pastures.

H. W. Schneck — Variety tests of forcing tomatoes.

Strain tests of Grand Rapids lettuce.

Training experiments with forcing cucumbers.

H. W. Schneck and A. C. Thompson — Pollination of forcing tomatoes.

H. C. Thompson — Strain tests of Danish Ball Head cabbage.

Strain tests of Bonny Best tomato.

A study of the effects of cultivation as compared with merely scraping the soil to keep down weeds, on the soil moisture supply and on the yield of several vegetable crops.

An experiment to determine the effects of pruning and staking tomatoes on yield, earliness, size of fruit, etc.

An experiment to determine the effects of removing suckers from sweet corn.

H. C. Thompson and R. W. Axt — Fertilizer experiments and plant-growing experiments with tomatoes.

H. C. Thompson and F. O. Underwood — Fertilizer experiments and variety and strain tests with muck crops.

R. G. Wiggans — A study of various rotations on continued production by soils of different types.

A study of silage corn and supplementary silage crops, especially sunflowers and soybeans.

Yield tests of various grass and clover mixtures.

Variety tests of corn, oats, wheat, clover, and alfalfa.

Floriculture

In the Department of Floriculture the following work is under way:

A. C. Beal — Variety studies with peonies.

Variety studies with garden roses.

Variety tests of winter-flowering sweet peas.

Variety tests of gladioli.

A. C. Beal and S. C. Hubbard — Crossing studies with garden roses.

A test of stocks for garden roses.

D. Lumsden — Orchid breeding.

Lua A. Minns — Species, types, and varieties of hardy primulas.

A. W. W. Sand — Variety tests of pogon irises.

C. L. Thayer — Variety tests of perennial phlox.

Forestry

In the Department of Forestry the following paper is ready for publication:

J. S. Everitt — Working plans for a communal forest for the city of Ithaca, New York.

The following work is being carried forward:

John Bentley — The factors influencing the growth and yield of forest trees.

Advanced students are making a study of sawmill costs.

Landscape Art

In the Department of Landscape Art the following work is being done:

R. W. Curtis — A study for the purpose of establishing a foliage key to landscape plants.

E. G. Davis — A study of the history of landscape art in England.

J. P. Porter — Landscape architecture: its relation and application to the rural schools of New York State.

A study of the ferns of New York State in their relation to landscape art.

Meteorology

In the Department of Meteorology the following work is under way:

W. M. Wilson — Studies in evaporation.

W. M. Wilson and others — The relation of the climate of New York to the agricultural industries of the State.

Plant Breeding

In the Department of Plant Breeding the following papers have been published:

R. A. Emerson — Pistillate-flowered maize plants. Journ. hered. 11:65-76. 1920.

This paper gives the results of a mendelian study of two types of corn bearing seed in the tassel.

C. H. Myers — The use of a selection coefficient. Amer. Soc. Agron. Journ. 12:106-112. 1920.

This paper gives the results of some selections with dent corn for high yield of mature ears. An adaptation of the ear-to-row method was followed. In selecting, a coefficient obtained by multiplying the yield by the percentage of ripe ears was used.

The following papers are ready for publication:

E. G. Anderson — Inheritance of salmon silk color in maize.

Sarkis Boshnakian — The relation of the spelt factor in wheat to rachis internode length.

The genetics of squareheadedness and of density in wheat.

R. A. Emerson — The genetic relations of plant colors in maize.

W. H. Eyster — Zigzag culm in maize.

A genetic study of the tunicate character in maize.

G. P. McRostie — Inheritance of disease resistance in the common bean.

C. H. Myers, H. H. Love, and F. P. Bussell — Production of new strains of corn for New York.

The following work is under way:

E. G. Anderson — Linkage studies in corn.

F. P. Bussell — Breeding barley.

F. P. Bussell, C. H. Myers, C. B. Hutchison, and R. A. Emerson — Breeding corn for grain and silage.

R. A. Emerson — Mendelian studies with corn, with special reference to linkage.

R. A. Emerson and G. P. McRostie (in cooperation with the Department of Plant Pathology) — Breeding beans for high yield and disease resistance.

A. C. Fraser — Mendelian studies with Aquilegia.

A. C. Fraser (in cooperation with the Department of Floriculture) — Breeding hardy roses.

C. B. Hutchison — Mendelian studies with flax and corn.

H. H. Love — Mendelian studies with wheat and oats.

The effect of selection within pure lines of beans and oats.

H. H. Love (in cooperation with the Cereal Office of the United States Department of Agriculture) — Breeding wheat, oats, and rye.

C. H. Myers — Breeding timothy.

Tuber-selection studies with potatoes.

Breeding cabbage.

The possibility of the inheritance of variations induced by differences in nutrition in wheat.

Plant Pathology

In the Department of Plant Pathology the following papers have been published:

W. H. Burkholder — The dry root-rot of the bean. Cornell Univ. Agr. Exp. Sta. Mem. 26. 1919.

This paper reports the results of laboratory studies of the fungus *Fusarium martii phaseoli* n. form., which causes the dry root-rot of the bean, together with inoculation studies and with studies concerning the effect of soil temperature on the growth of the fungus. It also reports the results of experiments to determine the extent of the reduction in yield caused by the disease, and efforts to control it by soil treatments and by securing resistant strains through breeding.

The effect of two soil temperatures on the yield and water relations of healthy and diseased bean plants. Ecology 1:113-123. 1920.

The data given in this paper suggest that the *Fusarium* root-rot is about equally severe at a temperature of about 18° C. or at one of 26° C., though the bean plants grow more vigorously with the roots at the higher temperature.

H. M. Fitzpatrick — *Rostronitschkia*, a new genus of Pyrenomycetes. Mycologia 11:163-167. 1919.

E. M. Smiley — The *Phyllosticta* blight of snapdragon. Phytopathology 10:232-248. 1920.

Inoculation experiments and other studies of the organism *Phyllosticta antirrhini* Sydow, which causes a blight of the snapdragon, together with histological studies of the diseased tissue.

H. H. Whetzel — The present status of dusting. New York State Hort. Soc. Proc. 2:45-75. 1920.

This is a review of the results of experiments with dust spraying in the various sections of the country.

The following papers are ready for publication:

M. F. Barrus — Bean anthracnose.

C. Chardon — Pyrenomycetes of Porto Rico.

H. M. Fitzpatrick — Monograph of the Coryneliaceae.

E. F. Hopkins — The Botrytis blight of tulips.

The following work is under way:

M. F. Barrus — Investigations on some peculiar potato diseases.

F. M. Blodgett — Investigations into the nature and control of the leaf roll and mosaic diseases of potatoes.

O. C. Boyd — Diseases of potatoes.

W. H. Burkholder — Investigations on the bacterial blight of beans and other bean diseases.

C. Chupp — Investigations on the bacterial disease of the lima bean.

H. W. Dye — Investigations on the diseases of lettuce, particularly bottom rot and blights.

K. H. Fernow — Diseases of potatoes.

H. M. Fitzpatrick — Studies on the life histories and taxonomy of the Sphaeriales.

L. O. Gratz — Diseases of market garden crops, especially cabbage, eggplant, and potatoes.

R. S. Kirby — Root rot of corn.

L. M. Massey — Investigations on some diseases of gladioli and roses.

A. G. Newhall — Diseases of onions and lettuce.

F. R. Perry — A new disease of white pine.

S. P. Schlatter — Dusting for control of fruit diseases.

R. H. Vogel — Diseases of cabbage, cauliflower, and potatoes.

H. H. Whetzel — Continuation of work on Botrytis diseases of plants.

R. P. White — Blossom-end rot of tomatoes.

Pomology

In the Department of Pomology the following papers have been published:

- D. B. Carrick — Resistance of the roots of some fruit species to low temperature. Cornell Univ. Agr. Exp. Sta. Mem. 36. 1920.

In a laboratory freezing chamber the smallest roots of French apple seedlings killed at a temperature of -10° C. or even higher, while the largest parts of seedling roots, one year old, killed at temperatures between -12 and -16° C.; this when the roots were the most resistant, in midwinter. Young roots of French pear seedlings and of Kieffer pear seedlings, and roots of sweet cherry, of Myrobalan plum, of Lindley, Norton, and Cynthiana grapes, of the blackberry, and of the red raspberry, were less resistant than those of the French apple seedlings, while roots of the Mahaleb cherry seedling, the Clinton, Concord, and Diamond grapes, the Wilder currants, and the Downing gooseberries were more resistant — roots of the Downing gooseberry withstanding a temperature of -20° C. Roots surrounded by soil seemed to kill at about the same temperatures as when surrounded by air. Roots were more resistant in a slightly wilted condition than when turgid.

- W. H. Chandler — Some results as to the response of fruit trees to pruning. Soc. Hort. Sci. Proc. 16 (1919): 88-101. 1920.

It is reported in this paper that pruning either while dormant or during the growing period markedly dwarfs fruit trees. The dwarfing effect is much greater with young trees than with older ones. While pruning dwarfs the older trees, it appreciably increases the vigor at the growing points that are left. This increased vigor seems to result from the fact that fewer growing points are supplied with water and mineral nutrients from a root system that temporarily is not reduced. Root growth following pruning is relatively less rapid than top growth, however, and so this increased vigor is only temporary. With apples, pruning reduces the fruitfulness of young trees to a much greater extent than it dwarfs them. This does not seem to be true of plums, and is less striking with pears than with apples.

- A. J. Heinicke — Concerning the shedding of flowers and fruits and other abscission phenomena in apples and pears. Soc. Hort. Sci. Proc. 16 (1919): 76-83. 1920.

This paper reports studies concerning the separation zone when the fruit falls; some characteristics of fruit doomed to fall; conditions that induce or hasten abscission; and conditions that delay or prevent abscission. The author seems to find that the causes which stimulate or excite the peculiar changes in this region are associated with variations in nutrition and water supply. If the tissue above the plane in which separation may occur is abundantly supplied with water and other substances that counteract maturity or favor translocation or utilization of assimilated material, conditions apparently are not favorable for manifestation of the meristematic nature of cells in the potential abscission zone.

The following paper is ready for publication:

- H. A. Phillips — Effect of climatic conditions on fruit trees in relation to the blooming and the ripening dates, and the length of the growing period.

The following work is under way:

- W. H. Chandler — The effect of the pruning necessary to secure various forms, on the leaf surface, growth, and fruiting habit of apples, pears, plums, quinces, cherries, and peaches.

The effect of pruning and of fruiting, especially seed production, on the amount of dry matter produced by a given leaf area, with apples, cherries, and grapes.

The relative response of gooseberries, currants, red and black raspberries, blackberries, young apple trees, and corn, when growing in the same soil, to applications of fertilizers.

The recovery of fruit trees from serious winter injury.

- A. J. Heinicke — Factors that influence the abscission of flowers or young fruits.
 Factors that influence the size and water supply of fruits.
 Studies on the catalase activities of fruit-tree tissues.
 The effect on fruit trees of possible secretions from grass roots.
 The effect of different styles of pruning on the percentage of apple blossoms that set fruit.
- A. J. Heinicke (in cooperation with the Department of Soil Technology) — The effect of grass on the nitrogen supply of fruit trees, and the response of the trees to variations in the nitrogen supply.
- R. W. Rees — Variations in the internal structure of apples and pears as a possible means of identification.

Poultry Husbandry

In the Department of Poultry Husbandry the following paper has been published:

- E. W. Benjamin — A study of selections for the size, shape and color of hens' eggs. Cornell Univ. Agr. Exp. Sta. Mem. 31. 1920.

The author of this paper concludes that the variability of a bird's production for a certain character does not depend on the difference existing between that bird's parents for the same character. It appears that small size and length of egg are dominant, while there seems to be no dominancy whatever for color. The type of egg incubated affects the mean type of egg produced during the life of the bird hatched, to a greater extent than it affects the pullet-year production or the production of any other single year.

A strong correlation exists between the types of eggs produced by individuals and the type of eggs from which these individuals were hatched. There is no correlation between the size and the shape of eggs produced by the birds used in this experiment. No definite tendency is shown toward a reduction of the variability of type of eggs produced by individual birds during successive years. During the pullet year the size of the eggs produced increases rapidly, but after the first year's production no appreciable change in the size of the eggs produced can be found. There seems to be no perceptible and consistent difference between the shapes of eggs laid by pullets and those laid by hens.

There is no gradual darkening of the shell pigment after the second year's production. Each year there is a tendency for the eggs produced to be more and more white during the first five or six months of production, and then to be more tinted again toward the end of the production season.

A distinct positive correlation is found between the size of the eggs incubated and the vigor of the respective chicks hatched, at various ages of the chicks; this correlation is especially significant during the period of severe weather conditions. There is a significant positive correlation between the size of the eggs incubated and the size of the respective chicks hatched; this correlation persists during the life of the birds as far as it was studied, that is, during a period of 228 weeks.

The following articles in trade journals are based on studies conducted in the department:

- E. W. Benjamin — Handling of market eggs. (National poultry, butter, and egg bulletin.)
- O. B. Kent — How to tell a laying hen. (Country gentleman.)
 Methods of picking out the best laying hens. (Country gentleman.)
 Characteristics of egg type. (Country gentleman.)
 Definite plan of breeding for egg production with a minimum use of trapnests. (Reliable poultry journal.)
 A practical judging system. (Reliable poultry journal.)
 Trap-nest pedigree breeding for egg production. (Reliable poultry journal.)
 Selecting roosters to increase production. (Cornell countryman.)

- J. E. Rice — Influence of illumination on egg production. (Country gentleman.)
Artificial illumination as a factor in egg production. (Cornell countryman.)

The following work is under way:

- Mavia Allen — Correlation of market-egg qualities with cooking values.
V. S. Asmundson — Relation of keel and pelvic bones to shape and production.
E. W. Benjamin — Determination of egg grades.
L. E. Card — Influence of season of hatching on egg production and cost.
G. F. Heuser — A study in the rate and method of digestion of feeds on egg production.
The effect of rations previous to hatching season on egg production, fertility, and hatching quality at the breeding season.
G. F. Heuser and J. E. Rice — Feeding pullets for egg production with artificial illumination.
O. B. Kent — Inheritance of fecundity.
The relation of physical characters to egg production.
Inbreeding.
Effect of cumulative selection on external characters.
Inheritance of comb type.
Comparison of breeds and varieties for egg production.
Relation between pigmentation of the parents and the hatching quality of eggs.
H. I. Macomber — Preservation of market eggs.
Causes of loss of eggs and poultry in transit.
J. E. Rice — Distribution of egg production.
The effect of illumination on production.

Rural Education

In the Department of Rural Education the following paper is ready for publication:

- W. F. Lusk — The use of land in connection with the agricultural boarding schools of the South.

The following work is being carried forward:

- J. E. Butterworth — Rural school finance.
Building scales for rural schools.
P. J. Kruse — Use of psychological tests as a basis of admission to college and of educational guidance.
R. M. Stewart — Inequalities of school support in Iowa.
G. A. Works, P. J. Kruse, J. E. Butterworth, T. H. Eaton, and O. G. Brim (in cooperation with workers from other universities) — A rural school survey of the State of New York.

Rural Engineering

In the Department of Rural Engineering the following work is under way:

- J. C. McCurdy — Methods of subsurface irrigation for domestic sewage.
J. C. McCurdy and H. W. Riley — Engineering problems in the disposal of creamery sewage wastes.
H. W. Riley and F. L. Fairbanks — Implement draft.

Rural Social Organization

In the Department of Rural Social Organization the following work is under way:

- D. L. Sanderson — The rural churches of Tompkins County.
W. S. Thompson — A study of the Sherwood community.
A study of the social relations of the rural schools in Tompkins County.

Soil Technology

In the Department of Soil Technology the following papers have been published:

T. L. Lyon, J. A. Bizzell, and B. D. Wilson — The formation of nitrates in a soil following the growth of red clover and of timothy. *Soil science* 9:53-64. 1920.

Twelve cylinders capable of being leached were filled with a soil of medium fertility and good drainage qualities. The soil was abundantly limed and was fertilized with acid phosphate, muriate of potash, and dried blood. Six cylinders were planted to timothy and six to red clover. The soil of all cans was inoculated with *Bacillus radicicola* from clover nodules.

During the period when the timothy and the clover were growing, the soil was leached with distilled water from time to time. Nitrogen was determined in the drainage water and in the crops of timothy and clover. After these crops were removed the soil was allowed to remain in fallow for a month, and was then leached and nitrogen was determined in the drainage. Of the cylinders on which timothy had been grown, two were planted to oats and two to maize, and two were kept free of vegetation. The clover cylinders were treated in the same way. All were leached from time to time and nitrogen was determined in the drainage water and in the crops.

There was little difference in the quantities of nitrogen leached from the timothy soil and from the clover soil during the time when the two crops were growing on them. There was about six times as much nitrogen leached from the clover soil during the month when both soils stood fallow after the timothy and clover crops had been removed. There was only about twice as much nitrogen leached from the fallow clover soil as from the timothy soil during the next five months. At the end of this period the rate of nitrate production in the clover soil was little greater than that in the timothy soil. The crops of oats and maize following clover were larger, and contained more nitrogen, than those following timothy.

The experiment taken as a whole shows that, under the same conditions of soil and treatment, clover caused a greater production of available nitrogen than did timothy. This effect is shown in the nitrate content of the drainage water and the total nitrogen content of the oats and the maize. Whether the clover stimulated the nitrification process, or whether it contributed easily nitrifiable material, is not apparent from the data. If the greater production of nitrates in the clover soil was due to the decomposition of the residue of that crop, it appears that a part of this residue is more easily nitrifiable than dried blood, and that it constitutes only a small part of the entire residue of the clover crop.

R. A. Smith — Some effects of potassium salts on soils. *Cornell Univ. Agr. Exp. Sta. Mem.* 35. 1920.

In the experiments described in this memoir, potassium chloride decreased the accumulation of nitrates in all cases. Lime overcame this effect in part. Potassium sulfate apparently stimulated the accumulation of nitrates in Hagerstown and Dekalb soils.

The heavier potassium chloride treatments depressed nitrification of added materials. Potassium sulfate stimulated the process in all three soils with the exception of the heaviest treatment with Hagerstown soil. Lime had a tendency to correct the depression of the chloride in the Volusia soil, but did not entirely overcome it.

No iron nor aluminum was found in any of the water extracts, and no manganese was found in the extracts from the Volusia soil; hence the harmful action of the potassium salts cannot be attributed to replaced iron or aluminum, or to manganese in the case of Volusia soil. Both the chloride and the sulfate of potassium replaced calcium strongly. Less calcium appeared in the extract from the sulfate-treated series than would be expected, possibly because of the relative insolubility of calcium sulfate. Magnesium was replaced less strongly than was calcium. Manganese was replaced in very appreciable amounts in Hagerstown and Dekalb soil, particularly in the latter. The soil highest in

water-soluble manganese showed the least nitrifying efficiency, the smallest growth of wheat in pot cultures, and the poorest growth of wheat rootlets in extract cultures.

The effects of potassium salts on plant growth are due to a complex interaction of factors, involving perhaps the direct action of the salts on plant growth and on bacterial activities, and also the action of bases replaced by the potassium, particularly manganese.

H. W. Turpin — The carbon dioxide of the soil air. Cornell Univ. Agr. Exp. Sta. Mem. 32. 1920.

The results of this study indicate that the plant itself, and soil organisms, produce most of the carbon dioxide in the soil; that the plant often produces at the period of its most active growth many times as much carbon dioxide as is produced by soil organisms; and that the excess carbon dioxide in the soil growing a crop is due to respiratory activity of the plants rather than to the decay of root particles from the crop growing on the soil at the time of analysis.

A. F. Vass — The influence of low temperature on soil bacteria. Cornell Univ. Agr. Exp. Sta. Mem. 27. 1919.

When soils have been frozen there is sometimes an increase in the bacteria count as indicated by the agar-plate method. The author of this paper finds that this is due to the breaking-up of the clumps of bacteria, not to growth and multiplication. The results of some studies concerning factors that influence the resistance of bacteria to low temperature are also reported here, and a review of the literature concerning the killing of plant tissue by low temperature is given.

The following papers are ready for publication:

A. F. Gustafson — The effect of drying soils on the water-soluble constituents.

T. L. Martin — Decomposition of green manure at different stages of growth.

The following work is under way:

T. L. Lyon, J. A. Bizzell, B. D. Wilson, and E. W. Leland — Amount and composition of drainage water from soils, with special reference to the effect of liming and cropping.

T. L. Lyon, J. A. Bizzell, J. K. Wilson, A. J. Heinicke, and B. D. Wilson — The influence of higher plants on nitrogen transformation in soils.

T. L. Lyon, J. A. Bizzell, E. L. Worthen, and A. F. Gustafson — The composition and properties of certain soil types, and their response to fertilizers, lime, and plant growth.

This project includes the following purposes: to measure the nitrogen balance in soil under alfalfa and timothy grown continuously and under certain crop rotations; to ascertain whether the composition of a soil type, as now classified, is fairly uniform and characteristic; to ascertain whether the soil type, as now distinguished, is an index to the fertilizer needs of a soil; to test the availability of floats as influenced by farm manure, and to compare this carrier of phosphorus with acid phosphate by field trials; to compare the relative effectiveness as soil amendments of burned lime, limestone, marl, gypsum, dolomite, and magnesite, and of limestone ground to different degrees of fineness; to ascertain the effect on soil productivity of continuous cropping when the organic matter of the soil is maintained by means of seeded crops; to test various mixtures of fertilizer salts on different courses in a crop rotation as means of maintaining soil productivity; to test certain methods of soil management applied to Ontario loam and Volusia silt loam at different places in the State.

LIST OF PUBLICATIONS

The following publications of the College and Experiment Station have been issued during the year and distributed to the people of the State and to teachers and investigators in other States. They constitute part

of the annual report of the College and are issued separately as bulletins. Copies of any of these publications may be had on application to the Office of Publication, College of Agriculture, Ithaca, New York, so long as the supply lasts.

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
2 (Reprint) Action of certain nutrient and non-nutrient bases on plant growth (Department of Botany).....	102	1,000
5 (Reprint) Physiological studies of <i>Bacillus radicicola</i> of Canada field pea (Department of Botany).....	84	1,000
6 (Reprint) Fusaria of potatoes (Department of Plant Pathology).....	188	1,500
8 (Reprint) A bacterial disease of stone fruits (Department of Plant Pathology).....	64	1,000
10 (Reprint) A classification of the varieties of cultivated oats (Department of Farm Crops).....	96	3,000
11 (Reprint) Biology of the Membracidae of the Cayuga Lake Basin (Department of Entomology).....	276	1,000
18 (Reprint) A study of bacteria in ice cream during storage (Department of Dairy Industry).....	40	1,000
28 Cooperative marketing in the Chautauqua-Erie grape industry (Department of Rural Economy).....	94	4,000
29 The lecithin content of butter and its possible relationship to the fishy flavor (Department of Dairy Industry).....	58	5,000
30 Phosphorus in butter (Department of Dairy Industry).	36	3,500
31 A study of selections for the size, shape, and color of hens' eggs (Department of Poultry Husbandry).....	124	4,500
32 The carbon dioxide of the soil air (Department of Soil Technology).....	50	4,500
33 The ribbed pine-borer (Department of Entomology)...	19	4,500
34 An economic study of farm layout (Department of Farm Management).....	181	8,000
35 Some effects of potassium salts on soils (Department of Soil Technology).....	41	4,500
36 Resistance of the roots of some fruit species to low temperature (Department of Pomology).....	54	4,500
37 A modified Babcock method for determining fat in butter (Department of Dairy Industry).....	28	4,500
38 The crane-flies of New York. Part II. Biology and phylogeny (Department of Entomology).....	600 (est.)	4,500
Total.....	2,135	61,500
EXPERIMENT STATION BULLETINS:		
353 (Reprint) The interior quality of market eggs (Department of Poultry Husbandry).....	48	10,000
400 A comparison of fat tests in milk as determined by a cow-testing association and by a creamery (Department of Dairy Industry).....	66	20,000
401 A comparative study of some methods for determining the fat content of skimmilk (Department of Dairy Industry).....	20	7,000
402 The apple maggot in New York (Department of Entomology).....	16	12,000
Total.....	150	49,000

	Number of pages in printed publication	Number of copies printed
READING-COURSE LESSONS FOR THE FARM:		
12 (Reprint) The improvement of the wood-lot (Department of Forestry).....	24	1,000
72 (Reprint) Culture of the grape (Department of Pomology).....	20	5,000
106 (Reprint) Spring in the flower garden (Department of Floriculture).....	24	5,000
113 (Reprint) Judging draft horses (Department of Animal Husbandry).....	32	3,000
114 (Reprint) Silos, and the production and feeding of silage (Department of Animal Husbandry).....	24	5,000
115 (Reprint) Keeping sheep for profit (Department of Animal Husbandry).....	24	5,000
117 (Reprint) Computing rations for farm animals (Department of Animal Husbandry).....	68	10,000
121 (Reprint) The culture of garden roses (Department of Floriculture).....	28	5,000
122 (Reprint) Planting the home vegetable garden (Department of Farm Crops).....	24	5,000
123 (Reprint) Top-working and bridge-grafting fruit trees (Department of Pomology).....	28	5,000
130 (Reprint) Rearing chickens: brooder house construction (Department of Poultry Husbandry).....	32	10,000
133 (Reprint) Preparation of eggs for market (Department of Poultry Husbandry).....	40	10,000
141 (Reprint) Farm manure: its production, conservation, and use (Department of Soil Technology).....	32	5,000
147 Making advanced registry records (Department of Animal Husbandry).....	28	35,000
148 The use of lime on the soil (Department of Soil Technology).....	64	15,000
149 Principles of debate (Department of Extension Teaching).....	24	15,000
150 Hog cholera (College of Veterinary Medicine).....	20	40,000
151 Growing sweet peas (Department of Floriculture).....	36	40,000
152 China asters (Department of Floriculture).....	40	40,000
153 The country theater (Department of Extension Teaching).....	20	40,000
154 The peony: a flower for the farmer (Department of Floriculture).....	48	40,000
155 The country weekly in New York State (Department of Extension Teaching).....	46	45,000
156 Incubation (Department of Poultry Husbandry).....	40 (est.)	40,000
157 Feeding for egg production (Department of Poultry Husbandry).....	56 (est.)	40,000
158 Locating the rural community (Department of Rural Social Organization).....	36 (est.)	40,000
Total.....	858	504,000
READING-COURSE LESSONS FOR THE HOME:		
11 (Reprint) The laundry (Department of Home Economics).....	44	5,000
25 (Reprint) Saving strength (Department of Home Economics).....	16	5,000
31 (Reprint) Household bacteriology (Department of Home Economics).....	20	2,000
85 (Reprint) The arrangement of household furnishings (Department of Home Economics).....	12	5,000

	Number of pages in printed publication	Number of copies printed
READING-COURSE LESSONS FOR THE HOME (<i>continued</i>):		
112 (Reprint) Short cuts for the home dietitian (Department of Home Economics).....	44	1,000
117 (Reprint) Cereals in the diet (Department of Home Economics).....	28	1,000
123 (Reprint) A program of thrift for New York State (Department of Home Economics).....	8	50,000
124 (Reprint) Making a budget (Department of Home Economics).....	12	50,000
125 (Reprint) Self-study outlines for promoting thrift (Department of Home Economics).....	8	50,000
126 (Reprint) How to keep a cash account (Department of Home Economics).....	8	25,000
127 (Reprint) What to spend for food (Department of Home Economics).....	4	25,000
128 (Reprint) Points in selecting the daily food (Department of Home Economics).....	8	25,000
129 (Reprint) Questions for group discussions on thrift (Department of Home Economics).....	4	25,000
130 (Reprint) Club programs on thrift (Department of Home Economics).....	16	25,000
131 Economics of a sound house (Department of Home Economics).....	8	75,000
132 Economics of good furnishing (Department of Home Economics).....	4	75,000
133 Use more cheese (Department of Home Economics)...	20	75,000
Total.....	264	519,000
EXTENSION BULLETINS:		
10 (Reprint) Gladiolus studies — II. Culture and hybridization of the gladiolus (Department of Floriculture)..	84	5,000
21 (Reprint) How to select laying hens (Department of Poultry Husbandry).....	16	5,000
34 Extension work in agriculture and home economics in New York during 1918 (Department of Extension)..	16	15,000
35 Composition of feeds (Department of Animal Husbandry).....	2	15,000
36 Soil survey of Saratoga County, New York (Department of Soil Technology).....	42	3,000
37 Soil survey of Oswego County, New York (Department of Soil Technology).....	44	3,000
38 Better livestock in New York State (Department of Animal Husbandry).....	12	25,000
39 Rural community conference (Department of Rural Social Organization).....	88	5,000
40 The preparation of marketable vinegar (Department of Agricultural Chemistry).....	14	10,000
Total.....	318	86,000
RURAL SCHOOL LEAFLETS:		
September, 1919 (Department of Rural Education).....	64	25,000
November, 1919 (Department of Rural Education).....	16	25,000
January, 1920.. (Department of Rural Education).....	50	150,000
March, 1920... (Department of Rural Education).....	64	150,000
Total.....	194	350,000

REPORT OF THE DEAN AND DIRECTOR

77

	Number of pages in printed publication	Number of copies printed
JUNIOR EXTENSION BULLETINS:		
1 (Reprint) First lessons in sewing (Department of Home Economics).....	44	10,000
2 (Reprint) Elementary garment making (Department of Home Economics).....	28	10,000
3 (Reprint) Rearing the dairy calf (Department of Rural Education).....	32	10,000
5 Raising pigs (Department of Rural Education).....	34	5,000
6 Potato growing for boys and girls (Department of Farm Crops).....	20	10,000
7 First lessons in food study (Department of Home Economics).....	84	10,000
8 Corn growing for boys and girls (Department of Farm Crops).....	20	5,000
Total.....	262	60,000
MISCELLANEOUS:		
Around the campus of the New York State College of Agriculture.....	28	3,000
Information for students.....	40	1,500
Program for thirteenth annual Farmers' Week, February 9-13, 1920.....	36	15,000
Program for Farmers' Field Days, June 30, July 1 and 2, 1920.....	16	5,000
Guide to a ride, Cornell campus and farms.....	32	3,000
Total.....	152	27,500
ANNUAL REPORT FOR 1919 (in two volumes).....	2,230	2,000
ANNOUNCEMENTS		
Announcement of summer term, 1920.....	25	3,000
Announcement of courses, 1920-21.....	88	15,000
Announcement of winter courses, 1920-21.....	40	10,000
Total.....	153	28,000

SUMMARY

	Total number*	Total pages	Copies
Memoirs.....	18	2,135	61,500
Experiment station bulletins.....	4	150	49,000
Reading-course lessons for the farm.....	25	858	504,000
Reading-course lessons for the home.....	17	264	519,000
Extension bulletins.....	9	318	86,000
Rural school leaflets.....	4	194	350,000
Junior extension bulletins.....	7	262	60,000
Miscellaneous.....	5	152	27,500
Annual report.....	1	2,230	2,000
Announcements.....	3	153	28,000
	93	6,716	1,687,000

* Including reprints.

FINANCIAL STATEMENT, 1919-20

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1919	Receipts (Income and Smith-Hughes), 1919-20	Expenditures 1919-20	Balance	
						Lapsed	Unexpended June 30, 1920
State							
1918-19 Maintenance.....	\$874,738.00	\$801,687.24	\$ 73,050.76	.....	\$ 22,858.84	\$50,191.92	.....
1918-19 Game Farm.....	10,615.00	7,279.34	3,335.66	.....	2,116.22	1,219.44	.....
1918-19 Deficiency.....	8,000.00	6,831.80	1,168.20	.....	41.00	1,127.20	.....
1919-20 Maintenance.....	939,075.00	.....	939,075.00	.....	868,300.61	.....	\$70,774.39
1919-20 Game Farm.....	12,715.00	.....	12,715.00	.....	11,806.88	.....	908.12
1919-20 Deficiency (fuel).....	2,500.00	2,005.38	494.62	.....	494.46	0.16	.....
1919-20 Deficiency (printing).....	14,000.00	.....	14,000.00	.....	13,742.43	.....	257.57
Total.....	\$1,861,643.00	\$817,803.76	\$1,043,839.24	.....	\$919,360.44	\$52,538.72	\$71,940.08
Federal							
Morrill and Nelson.....	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch and Adams.....	27,000.00	.....	27,000.00	.....	27,000.00	.....	.....
Smith-Lever.....	170,191.92	.....	170,191.92	.....	170,188.73	\$3.19	.....
Smith-Hughes.....	.....	.....	*(1,824.19)	\$18,822.61	21,663.78	.....	*( \$4,665.36)
Total.....	\$217,191.92	.....	\$215,367.73	\$18,822.61	\$238,852.51	\$3.19	*(\$4,665.36)
Income							
Tuition and fees.....	.....	.....	\$40,841.49	\$ 93,566.75	\$ 88,396.78	.....	\$46,011.46
Sales and services.....	.....	.....	25,539.77	183,973.88	195,097.59	.....	14,416.06
Total.....	.....	.....	\$66,381.26	\$277,540.63	\$283,494.37	.....	\$60,427.52
Grand total.....	.....	.....	\$1,325,588.23	\$296,363.24	\$1,441,707.32	\$52,541.91	\$127,702.24

* Overdrafts on Smith-Hughes Fund covered by subsequent remittance from State Department of Education.

CONCLUSION

In submitting this report of the activities of the New York State College of Agriculture and the Cornell University Agricultural Experiment Station for the year 1919-20, I desire to record my great indebtedness for the able assistance of my associates, Dr. Cornelius Betten, the Vice Dean of Resident Instruction, Professor M. C. Burritt, the Vice Director of Extension, and Dr. W. H. Chandler, the Vice Director of Research, in its preparation.

Respectfully submitted,

A. R. MANN,

Dean and Director.

INDEX

A	PAGE
Acting President's letter of transmittal.....	11
Adams, R. M.....	26
Affiliation with New York Agricultural Experiment Station.....20,	57
Agricultural chemistry, research in.....	59
Agricultural economics and farm management, organization of department.....	22
Agricultural economics and farm management, research in.....	59
Animal husbandry, extension work in.....	41
Animal husbandry, research in.....	60

B	
Babcock, H. E.....	33
Behrends, F. G.....	26
Betten, Cornelius.....	26
Better-Seed Special.....	36
Binzel, Cora E.....	26
Blodgett, W. K.....	26
Botany, extension work in.....	41
Botany, research in.....	61
Brew, J. D.....26,	42
Butterworth, J. E.....	26

C	
Cady, B. J.....	41
Chandler, B. A.....	26
Chandler, W. H.....	27
Community meetings.....	35
Cornell reading course for the farm.....	39
Cornell reading course for the home.....	49
Cornell reading-course lessons, farm and home, list of.....	75
Cornell rural school leaflets.....	76
Cornell study clubs.....	49
Coryell, Jay.....	33
County agents, changes in personnel.....	33

D	
Dairy industry, extension work in.....	42
Dairy industry, research in.....	63
Dean's report.....	13
Dutton, G. C.....	42
Dye, H. W.....	26

INDEX

E		PAGE
Economics, increasing importance of.....		21
Entomology, extension work in.....		42
Entomology, research in.....		64
Exhibits.....		39
Experimental work of College.....		56
Experiment station bulletins, list of.....		74
Extension activities of College.....		28
Extension bulletins, list of.....		76
Extension schools.....		34
Extension staff.....		5
F		
Farm and home bureaus.....		31
Farm crops, extension work in.....		43
Farm crops, research in.....		65
Farmers' Field Days.....		36
Farmers' institutes.....		35
Farmers' Week.....		36
Farm management, extension work in.....		45
Ferriss, E. N.....		26
Financial report of College.....		78
Floriculture, research in.....		66
Forestry, extension work in.....		47
Forestry, research in.....		66
G		
Gilkey, Royal.....		26
Goodman, A. M.....		53
Griswold, R. E.....		28
H		
Hesler, L. R.....		26
Home bureaus.....	32,	48
Home economics, proposed college of.....		19
Home economics, extension work in.....		47
I		
Instructing staff.....		5
Instruction, changes in courses.....		28
J		
Junior extension bulletins, list of.....		77
Junior extension work.....	37,	49
L		
Landscape architecture, fellowship in Rome, Italy.....		28
Landscape art, extension work in.....		50
Landscape art, research in.....		66

INDEX

	PAGE
Lawson, E. G.....	28
Legislative program.....	13

M

McDaniels, L. H.....	26
Mann, A. R., report.....	13
Marketing and cooperation.....	46
Memoirs, list of.....	74
Meteorology, extension work in.....	50
Meteorology, research in.....	67
Milliman, T. E.....	33

N

New York Agricultural Experiment Station, affiliation of College with.....	20, 57
--	--------

P

Palmer, E. L.....	26
Plant breeding, extension work in.....	51
Plant breeding, research in.....	67
Plant pathology, extension work in.....	51
Plant pathology, research in.....	68
Pomology, extension work in.....	52
Pomology, research in.....	69
Poultry husbandry, extension work in.....	52
Poultry husbandry, research in.....	70
President's letter of transmittal. See Acting President's letter of transmittal.	
Publication office, work of.....	38
Publications of College, list of.....	74
Publications of College, summary of.....	77

R

Registration of students.....	27
Research activities of College.....	56
Rural education, research in.....	71
Rural education, work of department.....	24
Rural engineering, extension work in.....	53
Rural engineering, research in.....	71
Rural social organization, extension work in.....	54
Rural social organization, research work in.....	71
Rural social organization, work of department.....	24

S

Scholes, B. E.....	26
Seulke, K. J.....	26
Sibley, R. P.....	27
Simons, L. R.....	33
Smith, A. W., letter of transmittal.....	11
Smith, F. McK.....	28

INDEX

	PAGE
Smith, M. J.....	26
Soil technology, extension work in.....	54
Soil technology, research in.....	72
Staff appointment and changes.....	26
Staff of instruction and extension work.....	5
State fair exhibit.....	40
Strahan, J. L.....	26
Student registration.....	27

T

Taylor, C. A.....	33
Teaching staff. See Instructing staff.	
Thomas, H. E.....	52
Toan, E. L.....	33

V

Vegetable gardening, extension work in.....	55
Voorhees, J. H.....	26

W

Worthen, E. L.....	26
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STATE OF NEW YORK

THIRTY-FOURTH ANNUAL REPORT

OF THE

NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY

AND OF THE

AGRICULTURAL EXPERIMENT STATION

ESTABLISHED UNDER THE
DIRECTION OF CORNELL UNIVERSITY
ITHACA, NEW YORK

1921

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CORNELIUS BETTEN,

Vice Dean of Resident Instruction

W. H. CHANDLER,

Vice Director of Research

M. C. BURRITT, Vice Director of Extension

Transmitted to the Legislature January 15, 1922

UTICA
STATE HOSPITALS PRESS
1922

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OF CORNELL UNIVERSITY

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

ALBANY, January 16, 1922

To the Legislature:

In accordance with the provisions of the Statutes relating thereto, I have the honor to transmit herewith the Thirty-fourth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,
Commissioner of Farms and Markets.

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ACTING PRESIDENT'S LETTER OF TRANSMITTAL

September 20, 1921

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Agriculture,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing Agricultural Experiment Stations in connection with the Land Grant Colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

And the Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said University shall expend such moneys and use such property of the State in administering said College of Agriculture as above provided, and shall report to the Commissioner of Agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said College of Agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith on behalf of Cornell University the report for the year 1920-21 of the New York State College of Agriculture and the Agricultural Experiment Station, signed by the Dean of that College and the Director of the Experiment Station, Mr. Albert R. Mann.

Early in the academic year 1920-21 it became necessary for Cornell University to consider the future heating of the state buildings on the

campus, that is, the State Colleges of Agriculture and Veterinary Medicine and the State Drill Hall. The state authorities proposed that the University should provide heating capacity and sell heat to the State for its buildings here. This the University agreed to do; and I submit herewith the following actions of the Board of Trustees of Cornell University which give a complete history of the development of a plant for the centralized heating of all buildings for instruction and administration on the university campus:

At a meeting of the Committee on Buildings and Grounds held September 24, 1920, the following action was taken:

As the result of a site survey the State Architect brought to the attention of the Buildings and Grounds Committee of the Board of Trustees of Cornell University the disadvantage of continuing the present power plant of the Agricultural College. Even if kept in its present position it will be necessary to add extensively to the present construction in order to supply adequate heat and power to the proposed development. At present it appears possible to utilize the site of the present power plant for the extensive construction of the proposed rural engineering activities, and it is possible that if given up as a power plant the present power plant construction could be incorporated as a portion of the proposed rural engineering building. Be it therefore

RESOLVED: That the State Architect is authorized to develop the plans for the rural engineering building on the site of, and adjacent to, the present power house and include in his plans such of the present structure as may be utilized for the activities of the Rural Engineering Department, and be it further

RESOLVED: That a recommendation be made by this Committee to the Trustees of Cornell University that such heat, light and power as may be necessary for the supply of the agricultural school be furnished and sold to the State from a central power and heating station, following the same procedure that is now in operation for the supply of heat, light and power by Cornell University to the State Drill Hall.

RESOLVED: That the Superintendent of Buildings and Grounds be requested to prepare, in order that it may accompany the recommendation to the Committee on General Administration, an estimate of the cost and the financial results of administration of a new complete heating plant designed to accommodate both the University and the State Colleges.

At a meeting of the Agricultural College Council held September 2, 1920, the following action was taken:

RESOLVED: That the Agricultural Council concur in the recommendation of the Buildings and Grounds Committee as to the erection of a central heating plant for the entire University, including the State College.

At a meeting of the Committee on General Administration held October 2, 1920, the following action was taken:

The minutes of the Buildings Committee of September 24, 1920, were approved and the recommendations therein contained adopted, except as to paragraph 4, recommending the constructing of a central power and heating station by the University and the sale of the power and heat by the University to the State for the use of the State Colleges.

RESOLVED: That action on recommendation No. 4 of the Buildings and Grounds Committee be held in abeyance pending further information.

RESOLVED further: That the Agricultural College Council be requested to consider further and report on the policy of combining the interests of the State and of the University in a central heating plant, it being contemplated that the University shall erect and maintain the plant and sell the heat to the State.

That the Buildings Committee be requested to ask the State Architect to report upon a plan for a separate heating plant for the State Colleges, and the location and cost of such separate plant.

At a meeting of the Committee on Buildings and Grounds held November 12, 1920, the following action was taken:

RESOLVED: That the reports of the State Architect and of Henry R. Kent & Co. in regard to the heating plant be referred to the Agricultural College Council and the Board of Trustees with the information that the plan of a central heating plant for the whole University meets the approval of this Committee.

At a meeting of the Agricultural College Council held November 12, 1920, the following action was taken:

RESOLVED: That this Council join in the action of the Committee on Buildings and Grounds in approving the general studies and group plans showing the scope of the project developed to further the development of the College of Agriculture.

RESOLVED: That this Council approve in principle of the purchase of heat and power from Cornell University through the means of a central heating plant and recommend to the Board of Trustees of the University the adoption of a plan to that end.

At a meeting of the Board of Trustees held November 13, 1920, the following action was taken:

RESOLVED: That the report of the Committee on Buildings and Grounds in reference to a central heating plant for the University and the State Colleges be referred back to the Committee with the request that it continue its investigation of the matter as to plans and costs, and that a committee of five, to include the Chairman of the Finance Committee and the Chairman of the Administration Committee, be appointed to frame and recommend legislation to accomplish the consolidation of the heating plant of the University and the State Colleges and report. The Chairman appointed as members of this committee Trustees Sanderson, Blauvelt and Horace White (Chairman R. B. Williams, Finance Committee; Chairman VanCleaf, Committee on General Administration).

At a meeting of the Board of Trustees held January 8, 1921, the following action was taken:

It was referred to a committee consisting of the Acting President and Trustees Blauvelt and Edwards to consider and make recommendations as to the best method of procedure for the further study of the heating plants for the University and for the State Colleges and to report to the Committee on General Administration. The Committee on General Administration was authorized to make any appropriations deemed necessary.

At a meeting of the Committee on General Administration held April 2, 1921, the following action was taken:

The Special Committee consisting of Acting President Smith and Trustees Blauvelt and Edwards, to which was referred the matter of constructing a central heating system to supply heat for the buildings of the University to be served and the buildings of the State Colleges, submitted a report from Henry R. Kent & Co., dated April 2, 1921, relative to the construction cost and cost of maintenance and operation of such a system, from which report it appears among other things:

1. That a central heating plant may be constructed at or near the railroad station at East Ithaca sufficient to supply heat to the University as now served, the new chemistry building, the residential halls, Risley, Schoellkopf, the Agricultural College and one new building, and the Veterinary College, including a distributing system for all buildings to be served, except the State College, at an approximate cost of \$700,000.

2. That the cost of steam service with the existing plants enlarged to provide for the new chemistry building and one new Agricultural College building is stated at \$159,359; that the steam cost for the same buildings under the proposed new system is estimated at \$87,354, thereby reflecting a net saving in steam cost alone of \$72,005; that the annual cost of heat service with existing plants, including steam cost, amortization at the rate of 4 per cent, and interest at $7\frac{1}{2}$ per cent, is stated at \$192,479; that under the proposed new system, after paying interest at the rate of $7\frac{1}{2}$ per cent on the investment and providing for amortization at the rate of 4 per cent, the net saving under the two plans is estimated at \$23,625:

RESOLVED: That the University construct a central heating plant at or near the railroad station at East Ithaca with a capacity sufficient to supply heat to the University as now served, the new chemistry building, the residential halls, Risley, Schoellkopf, the Agricultural College and one new building, and the Veterinary College, including a distributing system for all buildings to be served except the State Colleges, and that an appropriation of \$700,000, or so much thereof as is necessary, be made for the purpose.

RESOLVED further: That the matter be referred to the Committee on Buildings and Grounds for the purpose of preparing detailed plans and specifications for such new system, with power to employ an engineer or

engineers for the purpose. The said Committee shall so design the proposed new system as to permit of the addition from time to time of the installation of additional heating units at a minimum cost.

At a meeting of the Board of Trustees held April 30, 1921, the following action was taken:

The minutes of the meeting of the Committee on General Administration of April 2, 1921, were approved, and the action therein contained ratified and confirmed.

The following report of the Committee on Finance was approved and the recommendations therein contained adopted:

WHEREAS: The Committee on General Administration of the Board of Trustees at its meeting on April 2 took action authorizing the erection of a central heating plant at East Ithaca to supply heat with a few necessary exceptions to the University at Ithaca, including the New York State Drill Hall, the Schoellkopf Memorial Building, the New York State Agricultural College, and the New York State Veterinary College, and including a distributing system for all the buildings to be served except the State Colleges, at an approximate cost of \$700,000, and further referred the matter to this Committee for the purpose of preparing the plan for the financing of the proposition in a way to provide for the amortization of the construction cost within 20 years, and to provide for an equitable interest return upon the capital investment, now therefore be it

RESOLVED: That this Committee recommend to the Board of Trustees that the Comptroller be authorized from time to time as the work progresses upon proper certificate to make payment for the cost of the erection of said central heating plant to an amount not exceeding \$700,000.

That the money so advanced shall be considered and treated as an investment of a portion of the Cornell Endowment Fund.

That until the plant is completed and in operation the interest on such advances, unless other provision is made by the Trustees for meeting same, shall be included in the cost of the plant.

That the University in its several units, the State Colleges, the Athletic Association, the State for the Drill Hall, and any other units to which heat or steam may be furnished shall be charged for and required to pay at least annually the pro rata cost of the heat or steam so furnished, including overhead expenses, repairs, and alterations to the plant, together with a proportionate amortization allowance and equitable interest upon the University's investment.

The interest charge shall consist of interest upon the total cost of the plant. Of the amount so collected, the income of the University shall be credited with the interest upon the then existing balance of the University's advances, and any remaining interest together with an amortization charge of 4 per cent per annum upon the total cost of the plant shall be credited upon the moneys advanced by the University until the total advance is paid.

At a meeting of the Committee on Buildings and Grounds held on June 15, 1921, the following action was taken:

The Comptroller reported that he has transmitted to the State Architect a complete copy of all actions by the Board of Trustees relating to the construction of a central heating plant for the entire University and had received the following acknowledgment:

"State of New York,
Department of Architecture,
Albany, N. Y., May 23, 1921.

Charles D. Bostwick, *Secretary*,
Board of Trustees,
Cornell University,
Ithaca, N. Y.

My dear Mr. Bostwick: Upon my return from the quarantine survey in Italy I received your communication of May 11th containing a complete record of the University's action in regard to the construction of the Central Heating Plant for the entire University including the State Colleges.

I have, as you know, gone very thoroughly into this power proposition in connection with the development of the plan for the Agricultural School, and believe that the scheme finally approved for action by the University will fulfill all of the requirements of economy and efficiency. It is a workmanlike and far sighted undertaking.

With best regards,

Faithfully yours,

L. F. PILCHER,

State Architect."

May I in closing this letter of transmittal call attention to the importance to the State College of Agriculture, and hence to the farmer of the State of New York, of the carrying out as soon as possible of the building program for the development of the State College of Agriculture which was authorized by the Legislature of 1920, and which is described in detail on pages 22 to 25 of Dean Mann's report which follows this letter.

Respectfully submitted,

ALBERT W. SMITH,

Acting President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1920-21

To the Acting President of the University:

Sir: I have the honor to submit herewith a report of the work of the New York State College of Agriculture for the academic year 1920-21.

Enrollment of students

The registration figures for the College show little change from those of last year. The effect of the war remains evident in the abnormally small enrollment in the junior class, which entered in the fall of 1918. The numbers in the present freshman and sophomore classes are also economic plight, are operating to limit attendance. The large freshman among which are the farm labor situation and the farmers' present economic plight, are operating to limit attendance. The large freshman class of last year contained a considerable number of students whose entrance had been delayed by reason of the war. The same is no doubt true of the winter courses.

Regular undergraduate students	1920-21	1919-20
Freshmen	351	414
Sophomores	319	247
Juniors	232	253
Seniors	240	302
	——1,142	——1,216
Special students	75	89
Winter-course students		
Agriculture (General)	156	231
Dairy Industry	43	55
Poultry Husbandry	37	48
Fruit Growing	24	22
Home Economics	39	21
Flower Growing	10	10
Vegetable Gardening	13	9
Game Farming	4	..
	—— 326	—— 396
Graduate students	215	229
Summer school students	530*	530*
	——	——
	2,288	2,460

*The same figures appear for the summer sessions of the two years, since that session is now counted as part of the following rather than of the preceding academic year, as was done in the tabulation published in last year's report. The enrollment in the summer school of 1921 (numbering, as this report is being written, the unexpected total of 920) will appear as belonging to the fiscal year of 1921-22.

Sources and objectives of the student body

Geographical. In spite of the fact that students who are not residents of the State of New York are held to pay a higher rate of tuition than is current in any other land-grant college in the United States, there have always been a large number of such students enrolled in the College. Ordinarily about 20 per cent of the undergraduates are from outside New York State, the lowest percentage being 15, in 1912-13, and the highest 23, in 1919-20. Their distribution is indicated in the following lists of States and countries from which the 278 non-resident students of the past year were enrolled:

Pennsylvania	52	Colorado	2
New Jersey	51	Kentucky	2
Ohio	20	Mississippi	2
Maryland	12	Missouri	2
Michigan	12	Montana	2
Washington, D. C.	11	Oklahoma	2
Massachusetts	10	Washington	2
Virginia	9	Alabama	1
Connecticut	7	Arkansas	1
Illinois	7	California	1
Iowa	5	Delaware	1
Texas	5	Indiana	1
Vermont	5	Kansas	1
Florida	3	Louisiana	1
Georgia	3	Maine	1
New Hampshire	3	Minnesota	1
Rhode Island	3	Nebraska	1
Tennessee	3	South Carolina	1
China	6	Armenia	1
South Africa	5	Central America	1
South America	3	England	1
Jugoslavia (including Serbia)	3	India	1
Denmark	2	Italy	1
Hawaii	2	Norway	1
Philippine Islands	2	Spain	1
Turkey	2		

Farm- and city-bred. To state accurately the proportion of student coming from city and country is a somewhat difficult matter, since the home address gives little indication of actual experience. A more nearly accurate statement may be made on the basis of the records of the Office of Farm Practice. That office investigates the actual farm experience of every male student upon admission, and gives training to students on the university farm or helps them to obtain farm employment elsewhere so that they may meet the college requirement in this respect before the

beginning of the senior year. The common farm operations are classified under thirteen headings, with a maximum of ten points credit in each. The student is required to present, before he may enter upon his senior year, forty points reasonably distributed in the list, and these forty points would correspond to a full year of farm work. The boy who has lived all of his life on the farm would, on entering college at the age of seventeen, be credited on the average with from forty to fifty points and would therefore not be held for further experience. The records show that during the past six years 32.9 per cent of the male students admitted had inadequate or no farm experience, 31.5 per cent were credited with from twenty to forty points, and 35.6 per cent were given forty or more points. The middle group, of course, includes some farm-reared boys who have not given full time to farm work during their summers previous to coming to college; and it includes, also, young men who have been engaged in some specialized line of agriculture, such as the florists' trade, seed trade, truck gardening, milk plants, and the like. The figures give no indication of significant change in respect to farm experience during the six years.

After-college employment of students. More difficult than, but fully as important as, determining the students' background of experience upon coming to college, is the task of finding out what occupations these students enter when they leave college and what measure of success they reach; but records complete enough to be of value are difficult and costly to obtain and their interpretation is not simple. The Alumni Association is cooperating with the Office of the Vice Dean and Secretary in making the alumni records more nearly accurate. The Office of Farm Practice is undertaking at the present time to make a thorough investigation of certain classes in order to obtain exact and dependable data. The information is needed, as the experience of its graduates must serve as a guide to the College in its work, and their increase in efficiency must be a measure of its own success.

Since its foundation, approximately 20,000 persons have enrolled for instruction in the College of Agriculture—a number too great and too widespread to be easily or frequently followed. Of this total, 6168 have been in the winter courses, and nearly all of these have gone into practical work, mostly in New York State. They will be found on farms in every part of the State, and in cheese factories, creameries, and related industries. About 4,588 have been enrolled in the six-weeks summer school, a large part of whom have been identified with educational work somewhere in the rural field. A total of 2,385 have been registered as postgraduates, and 7,298 have been enrolled as regular and special stu-

dents. It is from this group that the College must meet a dual obligation: to prepare some of this number to go directly into farming, and to prepare others to meet the demands for teachers, investigators, and highly trained specialists for all the fields of agriculture in government service and in industries relating to agriculture, leaders in farm organizations, county agricultural agents, and workers in highly technical or specialized private enterprises. There is no other institution provided by the State to train persons for the wide range of technical and professional positions of the first rank. The most rapid advance in agriculture in the interests of all the people will come from the work of these more highly trained men and women. They ultimately bring to State and Nation the largest return for the investment of public money made in them. If the figures were available for accurate measurement, they would probably show upward of one-half of the graduates of the full college course engaged in the vocations of agriculture, and most of the remainder in the higher specialized agricultural services.

In this connection it is important to note that a measure of success of a technical and professional college is, whether those who complete the work taken in the institution continue permanently in the field of work for which they have prepared themselves. The best available information indicates that approximately 86 per cent of all former students of the College of Agriculture are engaged in agricultural work—a record in which any institution might find gratification and encouragement. It completely answers the question as to whether the student who comes to the institution, enters with a bona fide intent to make agriculture his life work.

New York State Bankers' Association scholarships

For many years, the New York State Bankers' Association, chiefly through its Secretary, Mr. E. J. Gallion, and its Committee on Agriculture, has cooperated most helpfully with the College in promoting the junior extension, or boys' and girls' club work. During the past year, the Association gave further substantial evidence of its desire to encourage farm boys and girls to improve their agricultural practice by offering five scholarships, each in the amount of \$250, to cover railroad transportation and maintenance of five boys and girls who do the best junior extension work under rules laid down by the College of Agriculture, the scholarships to be available for the short winter courses given in the year 1921-22. These scholarships were donated by the present President of the State Association, Mr. S. G. H. Turner, President of the Second National Bank of Elmira, and the following four former

presidents of the State Association: Walter H. Bennett, Vice-President of the American Exchange National Bank of New York City, Henry C. Brewster, Chairman of the Board of the Traders' National Bank of Rochester, Lewis E. Pierson, Chairman of the Board of the Irving National Bank of New York City, and Robert H. Treman, President of the Tompkins County National Bank of Ithaca. Grateful acknowledgment is due these persons for their gifts to such a worthy purpose.

Changes in the staff

The year covered by this report witnessed the loss from the staff of the following valued teachers, who left to accept attractive posts elsewhere: E. G. Montgomery, Professor of Farm Crops and Head of Department; K. C. Livermore, Professor of Farm Management; E. O. Fippin, Extension Professor of Soil Technology; R. W. Rees, Extension Professor of Pomology; Lulu Graves, Professor of Home Economics; H. E. Thomas, Extension Assistant Professor of Plant Pathology; M. D. Butler, Extension Assistant Professor of Vegetable Gardening; David Lumsden, Assistant Professor of Floriculture; Bonnie E. Scholes, Extension Assistant Professor of Home Economics; F. E. Robertson, Assistant State Leader of County Agricultural Agents.

The following appointments have been made, effective during the past fiscal year: Dr. Orville G. Brim, Professor of Rural Education, in charge of rural elementary education; Dr. Theodore H. Eaton, formerly Professor of Agricultural Education in the Connecticut Agricultural College, Professor of Rural Education; Dr. C. E. Ladd, formerly Director of the New York State School of Agriculture at Alfred University, Professor of Farm Management; H. E. Babcock, Ph. B., formerly State Leader of County Agricultural Agents, Professor of Marketing; Dr. Doak B. Carrick, formerly of the Bureau of Markets, United States Department of Agriculture, Professor of Pomology; Gilbert W. Peck, M. S., formerly Agricultural Agent in Ontario County, Extension Assistant Professor of Pomology; Arno H. Nehrling, formerly head of the Department of Floriculture at the Massachusetts Agricultural College, Assistant Professor of Floriculture; E. A. Flansburgh, formerly County Agricultural Agent in Livingston County, Assistant State Leader of County Agricultural Agents.

On October 1, 1920, Professor A. J. Heinicke was promoted to the headship of the Department of Pomology.

At the Commencement meeting of the Board of Trustees, Dr. L. H. Bailey, the able and distinguished Director of this College for many years, who had retired in 1913, was elected Professor Emeritus. At the

same time Dr. W. H. Jordan, who for twenty-five years had directed the New York Agricultural Experiment Station at Geneva with conspicuous success and who held appointment to the staff of this College by reason of the affiliation of the State College and the State Experiment Station, was elected Professor of Animal Nutrition, Emeritus.

Dr. R. W. Thatcher, successor to Dr. Jordan as Director of the New York Agricultural Experiment Station, was elected Professor of Plant Chemistry in this College.

Changes in internal organization

A number of important changes in the internal organization of the College should be recorded.

On September 25, 1920, on the proposal of the Dean, the Agricultural College Council recommended to the Trustees the consolidation in the College of Agriculture of the instruction in botany now being given in the University, involving the transfer to the College of Agriculture of one professorship, and the transfer to the College of Arts and Sciences, Department of Chemistry, of the work in agricultural chemistry now being given in the College of Agriculture. At the same time the Dean called attention to the fact that the State Architect, in preparing plans for the development of the College of Agriculture, was providing space for work in zoology, pursuant to the action of the Trustees of January 15, 1915.

On November 12, 1920, on the proposal of the Dean, the Agricultural College Council recommended to the Trustees that there be transferred from the College of Agriculture to the College of Architecture the design and construction phases of landscape art as now existing in the former College, the College of Agriculture to retain responsibility for instruction in the selection, care, and use of plant materials in landscape design and in country planning, and for extension teaching in landscape art, that is, in the development of extension service for the improvement of country life by means of better planning of rural communities and of both public and private properties within them. In order to retain the necessary unity in the professional landscape work, it was agreed between the Deans of the two Colleges that it is desirable that the head of the landscape instruction, or his successor, in the College of Architecture, should retain his seat in the Faculty of Agriculture, and that the person in charge of plant materials of landscape design in the College of Agriculture should be given a seat in the Faculty of Architecture.

The foregoing proposals were made in the interest of better educational organization, in order to bring together within the University department of instruction working in common subject-matter fields. The proposal

were approved by the Board of Trustees, the details as to time and manner of transfer being referred to the President with power.

On April 29, 1921, the Dean recommended to the Council that the Department of Farm Crops be discontinued as a separate department; that the crop-improvement and variety-testing work be transferred to the Department of Plant Breeding, already engaged in such work, and that the crop-production aspects be transferred to the Department of Soil Technology; that the latter department, because of its broadened functions, be renamed the Department of Agronomy and continued under the headship of Dr. T. L. Lyon. Experience had shown that, in the organization of the College, the field allotted to farm crops was so restricted as to adversely affect the development of the subject and the freedom of the teachers and investigators. The new arrangement effected is not entirely free from arbitrary allotment of services; collegiate departments seldom are. Under the existing departmentalization of the College, and the stage of development of the several subjects affected, the changes seemed to offer the largest promise of substantial gains and at the same time to meet the demands of logical organization.

Incident to these changes, it was further recommended that the Department of Vegetable Gardening, which at the outbreak of the World War had suffered almost complete loss of its staff and for administrative convenience had been temporarily joined to the Department of Farm Crops, be reestablished as a separate department. Professor H. C. Thompson was named head of the reestablished department.

All of these changes were approved by the council and confirmed by the Board of Trustees.

During the past year, the Trustees amended the statutes of the University so as to provide that the Dean of the New York State Veterinary College should be made a member of the Agricultural College Council, and the Dean of the New York State College of Agriculture be made a member of the Veterinary College Council. This association will undoubtedly prove beneficial to both Colleges, not alone because they have common problems as state institutions, but quite as much because they are both concerned with the livestock industries of the State. It should also help to assure in future the continuance of the cordial relations which have existed between the two Colleges.

The building program

Progress on the building development of the College, authorized by the Legislature of 1920, has been chiefly in four directions:

(1) On November 11, 1920, the State Architect presented to a joint meeting of the Agricultural College Council and the Committee on Buildings and Grounds of the Board of Trustees of Cornell University, studies, plans, and outlines, showing the character and scope of the contemplated additions to the College of Agriculture in respect both to classroom and to farm buildings, based on a detailed statement of the needs of the College filed with the Legislature of 1920. These comprehensive studies were approved by the joint conference, and were confirmed by the Trustees on the day following.

In addition to a detailed verbal explanation of the plans, the State Architect presented the following statement:

STATE OF NEW YORK
DEPARTMENT OF ARCHITECTURE
ALBANY

November 11, 1920

*Report Regarding General Status and Group Plans for Agricultural
Schools, Cornell University*

The general or group plan submitted herewith, presents the final results of the cooperative study between the State Architect and the Committee on Buildings and Grounds of the Board of Trustees, the Dean of the Agricultural School and members of the Faculty, and the Consulting Architect.

It is confidently believed that it represents practically the first attempt to develop a complete, comprehensive group plan of all the activities involved in Agricultural Education. It has been developed with a deep consciousness of the supreme importance to the American people of providing an institution broad, comprehensive, and complete in all its parts for education in this noble and fundamental calling. It has been visualized as a recognition on the part of the people of the State of New York that, if this Nation is to survive. Agriculture must be and continue as one of the most honorable, lucrative and inspiring of vocations, requiring the best of educational equipment, the most complete technical knowledge and practical experience. As a mold in which citizenship of high ideals must be cast, it has been my effort in this group of buildings to present something worthy of the calling of agriculture, a calling which from ancient times has been the foundation on which the prosperity and civic standing of all nations has been based and which has been so intimately interwoven into the lives of the people, forming in fact, an essential part of their religion as expressed in human terms.

The plan submitted to Governor Smith and the Legislature on which the present appropriation was based, has been developed with these ideals constantly in mind. The inspection trip of the big Agricultural Colleges of the Middle West at Urbana, Ill., Madison, Wis., St. Paul, Minn., Ames, Iowa, Lincoln, Neb., Lansing, Mich., etc., has confirmed the wisdom of the general design and composition of the group, emphasizing the soundness of the principle of planning in the great quadrangle. The generally scattered disposition of buildings in most of the institutions results in no outstanding or definite impression. At Lincoln alone is there any definite attempt at grouping, but not on any such comprehensive and coherent scale as in our group for the New York State College of Agriculture.

The combining of the remodeled Roberts and Stone Halls and Dairy Buildings with the Home Economics and Caldwell Hall and the new buildings for Plant Industry and Biology, Library, Museum and Assembly Hall to form this great Agricultural quadrangle has been worked out in detail and with some modifications of the original plan. The plan for these buildings, as herewith submitted, represents the results of the inspection trip.

The building for Rural Economics and Farm Management has been developed in accordance with the requirements of this most important department, and has been located as originally planned, forming with Forestry and the new Poultry building a subsidiary group with its own forecourt.

The Agricultural Engineering building, located upon the site of the old power plant, has been developed along lines determined by the character of the topography of this site and also as the result of conclusions drawn from the inspection trip above referred to. This particular building must in its mass accuse the industrial type of buildings necessary in this class of work. The building consists of two parts, a head house of class room and office type, basement and three stories high, and a one story industrial type shop building to provide for all the laboratory work connected with tractors, gas engines, blacksmith, and other work of a purely shop character. As located, the head house is reached from the main campus level at the grade of the third floor, and there are also grade entrances at the 1st floor level from the present road to the power house and entrances at the ground level for the shops and basement of the head house. A road will be brought from the farm buildings direct to the shops by joining to the existing roads, so that tractors and heavy machines will be kept off of the main roads of the campus. Thus the noise, dirt, and objectionable features of this highly important department will be removed from the main buildings and yet be readily accessible. An entrance from the state highway will be developed.

The Dairy building, located as in the original plan, has been developed along quite different lines from the primary part. As a result of the inspection trip and seeing many commercial plants, the Dairy building has been designed with a head house, basement and three stories high for class rooms, laboratories, lecture room, etc., and the entire student and manufacturing work of the dairy industry will be put in a one story type of industrial light and airy construction, employing the most modern, scientific, and sanitary equipment and materials.

1. Plant Industry—Pathology
2. Biology—Botany
3. Museum and Library
4. Agronomy—(Caldwell)
5. Home Economics
6. Rural Economics and Farm Management
7. Home Economics
8. Roberts Hall—Administration
9. Stone Hall—Old Dairy Building
10. Agricultural Engineering
11. Dairy
12. Forestry
13. Poultry
14. Farm operations, barns, etc.

Respectfully submitted,

(Signed) LEWIS F. PILCHER.

The following actions of the Committee on Buildings and Grounds and of the Board of Trustees of Cornell University were taken on the recommendation of the State Architect, and in compliance with the provisions of the Appropriation Act that the plans "be approved by the Trustees of said University, by or before December 1, 1920."

WHEREAS, As the result of a survey made of the needs of the College of Agriculture of Cornell University by L. F. Pilcher, State Architect, under the direction of the Governor of the State of New York and the Legislature of the State of New York, a report was made that a scheme of development should be carried out that would show the complete extension requiring the expenditure of approximately six million dollars; and

WHEREAS, In accordance with a group plan, prepared by the architect in consultation with the various faculties and officials of the University, the immediate betterment requirements of the Agricultural College were demonstrated, and upon these drawings the approximate estimate of cost of three million dollars was made by the State Architect; and

WHEREAS, An appropriation of \$500,000.00 was recommended to meet the probable costs of the betterment projects up to and including the first of July, 1921; and

WHEREAS, In order that the interests of the State might be conserved and the probable economy of the best construction market be taken advantage of, it was legislated that the general studies and group plans showing the scope of the project, should be completed and presented for the approval of the Trustees of Cornell University previous to December 1, 1920; and

WHEREAS, As the result of the intensive study of the requirements of the Agricultural College made with the various faculties and experts of the College and with the members of the Committee on Buildings and Grounds; and

WHEREAS, Further, in accordance with the comprehensive check and advice of the Consulting Architect, Mr. Albert L. Brockway of Syracuse, N. Y., the plans presented to the Trustees for their information and action on Thursday, November 11, 1920, having been approved by the Committee on Buildings and Grounds in the following resolution,

WHEREAS, Having received from the State Architect, Lewis F. Pilcher, the general studies and group plans showing the scope of the project developed by him with the advice of the Consulting Architect, Mr. Albert L. Brockway, of Syracuse, N. Y., to further the development of the State College of Agriculture at Cornell University, it is

RESOLVED, That these plans, as presented, be and hereby are approved, and it is further

RESOLVED, That the plans, as hereby approved, be and hereby are recommended to the Trustees of Cornell University for their approval.

NOW THEREFORE BE IT RESOLVED: That these plans be and hereby are approved in accordance with the requirements of Chapter 165 of the Laws of 1920, and the State Architect is hereby directed to further develop such portions of these plans for contract during the winter, as the Committee on Buildings and Grounds of Cornell University shall determine upon.

(2) The State Architect has studied at length the requirements of departments and the most logical and advantageous association of departments and lines of work. On the basis of detailed information gathered in person at the College, and from data submitted by departments, the Architect has completed a large perspective, in color, showing the arrangement and proposed design of all of the main buildings required, except the additions to home economics. The accomplishment of this design sets the whole program substantially forward, showing, as it does, just what is required, how the parts are to be related, and how the necessary buildings can most suitably be grouped on the land area available. The design reveals, on the part of the State Architect, a clear understanding

of the requirements of the work, and of the spirit and purpose, of the College. It is an excellent achievement.

(3) As soon as the block plan for the enlarged development of the College began to take shape, it became evident that the contemplated new dairy building should be put forward for construction first, as the new construction in the main quadrangle would necessitate the removal of the manufacturing wing of the old building. By the close of the fiscal year, the detailed plans for the new dairy building were approaching completion, with every expectation that bids could be called for by the middle of July.

(4) The problem of heating the buildings, particularly those to be erected, has received special attention during the year and has been carried to a satisfactory conclusion. The existing heating plant is located adjacent to the classroom buildings, and the soot from the stack is a constant annoyance. Furthermore, the location involves hauling the coal nearly a mile from the railroad siding, much of the time across the college campus. The site of the heating plant is imperatively needed for the new building for rural engineering. It is thought, also, that some of the construction in the building can be incorporated into the rural engineering building. The decision of the Trustees, therefore, after extended consideration of the matter in consultation with the State Architect, to erect a central heating plant for the entire University, including the State Colleges, and to sell heat by meter to the State Colleges, was a decision as wise as it was welcome. It will make for substantial economies both in construction and in operation.

On May 11, 1921, the Secretary of the Board of Trustees addressed a communication to the State Architect, finally reviewing the actions of the Trustees in the matter. This was acknowledged and approved by the State Architect. Copies of this correspondence are included in the President's report as a matter of record and in order that the Legislature and the executive officers of the State may have the complete statement.

The necessity for carrying out the enlarged building development without interruption cannot be urged too strongly. The College is in the utmost need of relief in all of its departments. It is now more than eleven years since a plan embodying most of the structures now contemplated was first presented to the Legislature, and the conditions have grown steadily worse.

Land for a biological field station

Cornell University enjoys exceptional advantages for studies in natural history. The past year has brought noteworthy additions to the facilities of the institution for biological science. On the recommendation of the

Dean, the Trustees purchased some twenty acres of swamp and marsh land adjacent to the southeast end of Cayuga Lake for a biological field station for the College of Agriculture. No more convenient or suitable site could have been found.

Shortly thereafter, Professor Jeremiah W. Jenks, of New York, formerly of Cornell University, gave to the University, for the purposes of the field station, a concrete, three-compartment boathouse and a lot on the lake shore, near the other property. This will be most useful in connection with studies on the biology and resources of Cayuga Lake.

In the late winter, Mr. Jared T. Newman, a trustee of the University, who by other generous acts has promoted the biological activities, presented to the University, as an adjunct to the biological station, an area of several acres of rocky woodland on the hillside directly across the lake road from the field station tract. Being entirely different in character and in fauna and flora from the swamp tract, the area makes a valuable addition. It will probably be retained mainly as a wild life preserve, although a permanent stream on it will be available for water cultural uses.

These acquisitions lay the foundation for a biological field station of exceptional value in connection with the University. When the building needs of the College were placed before the Legislature in 1920, there was included an item for a field station building. When this is provided, the areas will be intensively used. It is an attractive prospect for students of biology and agriculture.

Additions to the botanical and entomological collections

The botanical staff is sparing no efforts to add to its already large collections. During the year, more than 16,500 sheets were added to the herbarium. The most notable acquisition is the entire moss, hepatic, and lichen herbarium of Dr. J. K. Small, Curator of the Museum of the New York Botanical Gardens. This collection is particularly rich in sets from various specialists both at home and abroad, and it places at once the moss herbarium of the College on a research basis.

The herbarium of Mr. Stewart Burnham (about 60,000 specimens) has been deposited with the College for its use.

During the coming summer, a party under the leadership of the head of the Department of Botany will undertake an automobile collecting tour to the Pacific Coast, traveling at their own expense and making collections for the department herbarium.

During the year 1919-20, Dr. J. C. Bradley, Professor of Entomology and Curator of Invertebrate Zoology, conducted at his own expense

extended entomological explorations in South America. His excursion had the dual purpose of making collections and establishing helpful contacts with many of the leading institutions and workers in entomology in South America. The expedition was eminently successful in both respects, and the entomological interests of the United States and of this institution were greatly furthered thereby. Professor Bradley has placed the University and the State under great obligation to himself. On much of his trip he was accompanied by Dr. W. T. M. Forbes, of this institution, who contributed largely to the collections that were made.

The immensity of the collections were such that much time will yet be consumed before all will be mounted and identified. Enough has been done, however, to warrant the following report: There were collected about 10,000 specimens of Lepidoptera, representing between 2,000 and 3,000 species. Most of these have been mounted and identified. Of other insects collected, about 1,000 were mounted in the field and approximately 27,000 have been pinned since the expedition returned home. It is estimated that approximately 50,000 specimens yet remain to be mounted. The total number of specimens gathered will run somewhere from 90,000 to 100,000.

In addition, Dr. Bradley made considerable collections of wasps' nests and other examples of insect architecture. He obtained by gift or exchange 2,000 insect specimens from Dr. Carlos Reed, 2,000 from Alfredo Faz, 1,000 from the National Museum in Santiago, Chili, and 1,000 from the National Museum in Montevideo. Material yet to be received, but for which arrangements were completed, include collections from the Museu Palista in Sao Paulo and from the National Museum of Brazil in Rio de Janeiro, and a collection of ants of Argentina and their architecture from Dr. Carlos Bruch.

The experimental game farm

Chapter 747 of the Laws of 1917 appropriated \$15,000 "To provide for the acquisition of land for a game farm in Tompkins County for the conduct of practical experiments in and the giving of instruction on the breeding of game." The act called on the Trustees of Cornell University to organize and administer the farm as a part of the New York State College of Agriculture. The Trustees and officers of Cornell University undertook this charge in the confident expectation that the State desired to enter seriously upon a program of investigation and education for the highest permanent utilization of its wild life resources. The act was originated and its passage accomplished by persons and organizations interested in the preservation and the increase of the wild life of the

State. Sportsmen, nature lovers, and others interested in the production of game as a farm enterprise, joined in urging the establishment of this experimental farm. The work has now been discontinued, due to the failure of the Legislature of 1920 to provide funds for its maintenance.

The object. New York State maintains three game farms for the propagation of game, mostly pheasants, for restocking purposes. It established the game farm in connection with the State College of Agriculture, not to duplicate the work of any of these farms, but to do what none of them does or is equipped to do—study the whole problem of game production and preservation from a scientific standpoint; make investigations and researches into the problems of more rapid increase under conditions of control, the development of superior strains, and the breeding and rearing, and hence the preservation to mankind, of fast disappearing species; and, through courses of instruction, prepare young persons for the business of rearing game for economic profit, as a valuable addition to the food supply, or for liberation for the benefit of sportsmen, or prepare them for employment as managers of game preserves, for which there has long existed a demand for trained men.

What has been done by the experimental farm. The act of 1917 carried an appropriation for the purchase of land for the farm. Time was required to locate a suitable area containing the necessary acreage, wood cover, flowing stream, and general suitability for the purpose, convenient to the College. When an available tract of the right character was found, considerable difficulty was experienced in obtaining a clear title. It was May, 1918, before the purchase was finally consummated and the land available for occupancy.

The Legislature of 1918 appropriated \$10,615 for the purpose of engaging the necessary staff to organize the farm and make a beginning on the work, and to provide such facilities as would be immediately necessary. The College limited its askings rigidly, believing it was wise to begin slowly and gain experience, and anticipating the gradual and sustained growth of the enterprise as the work normally developed. The appropriation for the last fiscal year, 1920-21, was, therefore, for the entire enterprise, but \$14,686.

The plan laid out by the College was to begin with the game birds, and as soon as this work was well established to direct attention to other game animals, particularly fur-bearing animals. The stock assembled consisted of ring-necked, silver, golden, Amherst, Mongolian, and versicolor pheasants; mallard, pintail, and teal ducks; wood duck; Canada geese; California quail; bobwhite; and ruffed grouse. For hatching purposes, a considerable number of domestic fowls were obtained.

After the Legislature of 1918 had made an appropriation for operating expenses, it was inevitable that time should be consumed in getting together the persons required to inaugurate the work, and in building equipment, making duck ponds, repairing buildings on the farm, and the like. It was therefore not until 1919 that real experimental work could be undertaken. In the meanwhile broad plans of investigation had, however, been developed.

The investigations actually undertaken included studies on food problems under conditions of control, development of selected and pedigreed strains, breeding to increase egg production, methods of handling eggs for incubation, methods of artificial incubation so as to increase output, and the like. Pheasants had long been raised under control. Studies were made of more economical and larger-scale production. The ruffed grouse is the finest native game bird, and it is rapidly disappearing. No successful means has yet been developed for its artificial propagation. Two years of work had been done with this bird on the problems of artificial feeding, breeding, and rearing. A group of investigations had to do with determining the feasibility of rearing various species of waterfowl for liberation to restock the marshes of the State, which have long since become depleted. There are thousands of acres of marsh land in the State suitable for the rearing of wild ducks, on which at present no waterfowl are raised. With a rapidly diminishing supply of raw fur, fur-farming is bound to become an important specialized farm industry. It cannot be successfully entered upon until much progress has been made by investigation as to how to breed and rear desirable species under conditions of control.

Since the establishment of courses in game farming by the State College of Agriculture, more than one hundred students have taken some of the work, and a number have specialized to fit themselves as game farmers or game keepers.

The State's investment. Including purchase of the farm, the State had an investment of more than \$30,000 in the land, equipment, facilities, and supplies. In addition, considerable stock was given to the farm by members of the American Game Protective and Propagation Association. There is also the investment of operating expenses for three years, totaling a greater amount and represented by accumulated experience and progress in the investigations and the organization of the enterprise.

What the failure of appropriations means. As a result of the failure of the last Legislature to make a further appropriation, the work was brought to a close on June 30. The staff was dismissed, the stock was shipped to the other game farms by courtesy of the Conservation Com-

mission, the pedigreed strains will be lost, the experiments are dissipated, and the State's entire investment and accumulated experience has come substantially to naught. It was beyond the range of possibility that results of immediate practical value could be obtained in so difficult an enterprise in two and one-half years. The value of the enterprise cannot be judged by results in so brief a time, but by the wisdom of the planning. It is useless to undertake such difficult investigative work unless it is to be long continued. On the strength of the State's request that the University undertake this work, courses of instruction were announced, and students were invited who enrolled with the expectation of fitting themselves for game farming as a life work. Their instruction must be discontinued. During the spring of 1921, with no special advertising, 118 requests were received from prospective students for 1921-22. They have had to be turned away. Is it just to the students, to the University, or to the State's wild life interests, that this should be done?

In passing it should be noted that the Legislature of 1920 appointed by joint resolution a special committee to consider and define the State's program for the protection and development of forestry and wild life. This committee, whose report appears as part of the report of the State Conservation Commission for the year 1920, discusses the wild life problem at length and specifically recommends to the Legislature the continuance and enlargement of the experimental game work being done by the State at the State College of Agriculture. Despite the recommendation of its own specially created committee, the Legislature failed to maintain the existing organization for the work.

The State must seek to place its protective and promotional activities on a scientific basis. This is the shortest cut to sound economy. New York, in common with the other States, has spent, and is destined to continue to spend, vast sums in the aggregate for the preservation of its native wild bird and animal life. Nature has given man its richest material possessions. Not only must these gifts not be lost through neglect, but they must increasingly be utilized for man's economic and social well-being. Fundamental to sound, speedy, and economical progress in this important field is adequate provision for research and education.

A program of forest and wild life conservation

The Legislature at its 1920 session adopted a concurrent resolution instructing the four state agencies chiefly concerned in the conservation of forests and wild life to formulate a program of conservation which should assign to each of them its sphere of activity. The text of the resolution follows:

RESOLVED, That the Conservation Commissioner, the Dean of the New York State College of Agriculture at Cornell University, the Dean of the New York State College of Forestry at Syracuse University, and the Director of the New York State Museum be and they hereby are directed to prepare an administrative and educational program for forest and wild life conservation, under which the respective spheres of activity of each institution shall be defined and delimited, and the basis of cooperation between them formulated; and to transmit this program to the Legislature at its next session as a part of the Annual Report of the Conservation Commission.

The complete report of the Committee was submitted to the Legislature in the Tenth Annual Report, for the year 1920, of the State Conservation Commission, pages 279-319. It deals at length with the problems referred to in the resolution, outlines the respective spheres of the several agencies, describing their proper functions and services, and makes recommendations for adjustments where specific conflicts have existed. Attention is respectfully called to this important statement.

In its conclusions and recommendations, the Committee defines the functions and responsibilities of the New York State College of Agriculture at Cornell University as follows:

In accordance with the laws defining its work, the State College of Agriculture through its appropriate departments should conduct collegiate instruction, research, and educational extension in forestry and in game farming, fish culture, and subjects dealing with wild life in general, including aquatic life, as phases of agriculture and as functions of the biological establishment which the State has provided at Ithaca. The teaching of forestry coordinate with the teaching in other departments of instruction in the College, is recognized as a necessary and integral part of its work as a college of agriculture.

In explanation and amplification of the foregoing conclusions, the report makes the following detailed statement concerning the New York State College of Agriculture at Cornell University:

The function of the New York State College of Agriculture at Cornell University is, with reference to the questions under discussion,

(1) To conduct teaching, research, and extension in forestry as a phase of agriculture, in accordance with the terms of the Administration Act of the College (Chapter 218, Laws of New York 1906) and of the Land-Grant Act of 1862.

(2) To conduct teaching, research, and extension in biology, the science of plant and animal life, including its subordinate branches:

(a) Game farming and wild life conservation, in accordance with special authorization therefor (Chapter 747, Laws of 1917).

(b) Fish culture, on the basis of its organization for this work definitely established as a phase of biology in 1906 and gradually developed as a regular part of the work of the College since that date. (Chapter 218, Laws of New York 1906; Land-Grant Act of 1862).

The Work in Forestry

The teaching of forestry. Agriculture is the raising of products from the land. The State College of Agriculture approaches forestry from the standpoint of agriculture. The forest is a crop, differing from other crops in the details of its handling, but not in its essential features. The teaching of forestry is an integral part of a fully developed college of agriculture, using the word agriculture in the broad sense in which it has long since been applied in colleges of agriculture

throughout the United States, in agricultural experiment stations and in the United States Department of Agriculture of which the National Forest Service is a component part, along with plant industry, animal husbandry, and the like. The forest crop is produced partly on farms and partly in segregated areas or so-called forest regions. Of approximately 14,000,000 acres in forest areas in New York State, 4,600,000 acres are in the Adirondack forest region, 1,200,000 acres are in the Catskill forest region, 4,100,000 acres are in farm woodlots, and the other large areas best suited for a forest crop, approximating 5,000,000 acres, are on lands now or previously largely enclosed within farm boundaries. According to the census of 1910, New York held second rank among the states of the Union in the value of farm forest products, producing more than one-twentieth of the total farm forest products reported in that year.

We have come to speak of farm forestry. There is, of course, no such thing as farm forestry except as a designation of place where the work may be done. The management of a forest tract, whether on a farm or in a segregated forest region, involves the application of the general principles and practices of good forestry—the principles embodied in professional forestry. The general principles of forestry must be applied to the farm forests. Failure to recognize this fact fully, and the tendency to assume that the care of the farm forest is a superficial sort of undertaking, is responsible in part for the neglect and consequent unproductive condition of one-third to one-half of the State's entire present and prospective forest area which is now within the confines of farms. It is not necessary that the prospective farmer should have full professional training in forestry. He should receive instruction in the general principles and practices of forest operation and development as he does in other farm operations; but there should also be opportunity for those who desire to train themselves fully in this line.

The State College of Agriculture is prepared to meet the following three forestry needs: the giving of full professional training, the giving of limited particularized training, and the giving of informational courses for the general student. In the College of Agriculture the whole subject has been developed from the agricultural viewpoint to meet the necessity of making the instruction substantial. This instruction must be handled by professionally trained foresters. The opportunity to give full collegiate work retains on the university faculty men of the training and ability required to give good instruction to university students. To provide for this work the State Legislature by specific act has provided a forestry building and the necessary equipment. Facilities are now available at the college for the adequate instruction of professional forestry students to a number that is not likely for some time to come to tax the physical capacity of the department.

It may be pointed out in passing that full collegiate forestry courses are now developed in the land-grant institutions in California, Minnesota, Washington, Michigan, and others as well as in New York. The beginning in New York was made in 1898, with the establishment of the New York State College of Forestry at Cornell University. At that time, the instruction in agriculture was maintained chiefly on the private endowments and federal grants of the University. Through failure of the State to make an appropriation therefor, the State College of Forestry ceased to function in 1903. The year following, however, the State created the New York State College of Agriculture at Cornell University, and in 1910 forestry was established as a department of instruction therein.

Forestry in the State College of Agriculture ranks in place and opportunity coordinate with other fields of instruction. In an institution for the higher education, such as Cornell University, all instruction must be of university grade or standards; otherwise it would not be tolerated. In every department of instruction there must be opportunity for specialization, for advanced and post-graduate study. The opportunity to do advanced work in each department of instruction is inherent in the university organization. The institution must offer students desiring to pursue any phase of the broad field of agriculture the opportunity to follow that subject to the best and fullest advantage. Cornell recognizes this obligation as regards forestry by conferring the degree of master in forestry on the completion of the five-year professional course, the degree of bachelor of science being given at the end of the fourth year.

In teaching the economics of agriculture and the problems of farm management,

both of which are of outstanding importance in the curricula of colleges of agriculture, the forest areas must be considered as part of the agricultural or farm domain. Forest cropping is as essential a part of the instruction as animal husbandry or fruit-tree growing. These agricultural subjects interlock. They are alike necessary to complete and rounded instruction in agriculture.

The point of view at Cornell is that the study of forestry is to be approached from the side of crop production and the best permanent use of the land; that essentially the forester's job is the raising, caring for, and harvesting of successive crops of timber and other forest products; that forestry is primarily a land problem.

Under the existing organization in the State College of Agriculture the staff necessary to meet the forestry requirements of instruction in agriculture is able also to give the necessary advanced and post-graduate instruction in professional forestry. To teach forestry in the State College of Agriculture requires but comparatively small additional financial outlay, as is revealed by the appropriation for this institution. (Total state appropriation for salaries and maintenance of the Department of Forestry, exclusive of heat, light, and water, which are included in general college appropriations, is \$29,110.00 for 1920-21.)

Professional education in forestry requires, among other things, basic instruction in botany, meteorology, biology, plant physiology, zoology, entomology, plant pathology, surveying, and soil technology. In the State College of Agriculture all of these subjects are already highly developed for the students in general agriculture and so do not need to be duplicated for the students in forestry. The existing arrangements make it possible for the forestry students in the State College of Agriculture to work under teachers of established reputation; and the facilities are already available for the training of specialists in such fields as forest entomology and forest pathology.

With the growing realization of the importance of the farm woodlot, resulting from the educational extension in cooperation with the farm bureaus, there promises to develop a demand for professional foresters who have specialized on the problems of the farm woodlot. The State College of Agriculture is particularly well fitted to meet this need.

Research in forestry. Research and teaching are correlated and interdependent and cannot be separated in college or university organization. Research may thrive alone, but good university teaching cannot thrive apart from research. It is impossible to segregate fine scholarship from research. The educational institutions the world over have been the chief sources of advance in scientific endeavor. Their range of investigation has been as wide as the limits of learning. It is impossible long to maintain any department on a university basis if research is lacking. To advance in knowledge is indispensable. The universities must train creative minds, and they can do this only when their teachers engage in creative work, that is, in scientific research. No educational institution can hold a place of leadership unless it is constantly advancing into new ranges and widening the boundaries of knowledge.

No hard and fast line can be drawn between the acquisition of new knowledge, which is research, and its dissemination, which is teaching. Post-graduate students as part of their required training undertake investigations into new fields of knowledge.

Extension in forestry. Agricultural extension work had its beginnings in this country in the nineties of the last century at the College of Agriculture at Cornell University. Beginning in the nineties and continuing until the establishment of the State College of Agriculture, the Legislature made special annual appropriations to the College for this purpose. In the Administration Act of 1906, extension teaching was defined as one of the three coordinate lines of work to be undertaken by the New York State College of Agriculture. Since that time there has been large development of the extension service of the College. In 1914, the Federal Congress passed the Smith-Lever Act establishing cooperative agricultural extension work with the land-grant institutions,—Cornell University is the land-grant institution in New York State,—which provides gradually increasing appropriations of federal monies to be offset by the states, the minimum of which for New York State, on and after 1923, will approximate \$330,000 annually, about \$170,000 coming from the Federal Congress and at least \$160,000 from the State. Under the terms

of state and federal laws this money is applied to the extension service of the State College of Agriculture at Cornell University. On the basis of this law there is a signed agreement between the Secretary of Agriculture and the President of Cornell University providing for cooperation in the extension activities of the United States Department of Agriculture (which includes the Forest Service) and the State College of Agriculture, the administrative officer of the joint work in the State being the Director of Extension who is the Dean of the State College of Agriculture. On the basis of these funds and under the terms of the agreement with the Secretary of Agriculture, and as a phase of the Cooperative Extension Service, there have been placed in fifty-five counties (the agricultural counties) in New York, one or more county agents for the promotion of the agriculture of the counties. Subject-matter extension specialists in farm crops, animal husbandry, forestry, and all other departments of the State College of Agriculture conduct their extension work through and in cooperation with these county agents. This vast and highly efficient organization, supported by the consolidation of the State College and Federal Department extension forces, provides incomparable machinery for the promotion of extension in the whole field of agriculture and country life.

The educational extension in forestry now proceeding from the Department of Forestry in the State College of Agriculture includes, among other things, instruction in forest planting; cleaning and thinnings in immature woodlands; improvement cuttings on more mature woodlands; assistance and demonstrations in the management of woodlands; the furnishing of information on methods of appraisal of woodlands and the profitable disposal of timber and other forest products, such as maple sirup and sugar; the reforestation of non-agricultural lands within the boundaries of farms. The development of forests on the non-agricultural areas on farms is the particular sphere of forestry as a phase of extension teaching. The extension education seeks also to create an intelligent public opinion with reference to the importance of adequately safeguarding the timber supply.

The work in biology, including wild life conservation

Biology, which is the science of life, plant and animal, is fundamental to all agricultural teaching and reasearch. It embraces the whole field of living things. The various acts under which the New York State College of Agriculture exists, and the broad field in which it functions, have made necessary the development of effective facilities for work in biology, of which wild life conservation is one of the important branches.

It would be impossible to train men and women for all of the manifold phases of agriculture without ability to impart a sound foundation in biology. Problems of biology touch farm life at literally hundreds of points. The selection, care, and breeding of domestic stock involve biology. If this stock is to be improved by the addition of wild strains, we are taken out of the domestic field and into that of the wild. The growing of crops is influenced by animal and insect pests. These in turn are often held in check by birds or wild animals, and thus on the farm we find it of the utmost necessity to conserve many desirable species for the preservation of agriculture itself. Many forms of wild life upon the farm, or capable of being developed there, can be made to provide an important revenue. Thus a well rounded college of agriculture must study and give instruction in all these fields. Furthermore, all plants and animals now under cultivation were derived from the wild state; and nature has not yet exhausted her contributions to the needs of mankind. Her further gifts must be continually sought.

As these subjects are followed out into their various ramifications, new fields for specialization are opened, which invite the most intensive work of experts. The College must accordingly provide courses for the training of men who are to devote their lives primarily to a single branch of biological knowledge, such as entomology, fish culture, or any of the many subdivisions of zoology.

The New York State College of Agriculture has endeavored to meet the obligations imposed upon it in this field. Its equipment for biological research, teaching and extension is unsurpassed, and the personnel of its faculty is as strong as any to be found in this country. For years it has turned out men who have taken

high rank in the practical application of biological principles and the development of new knowledge.

As the subject of conservation of wild life assumed increasing importance, principally within the last ten years, the College was able, because of its existing equipment, to devote special attention to it, and to be among the first institutions to initiate special courses in conservation. With the machinery and personnel already developed, it thus had practically no additional expense. The curriculum furnishes the scientific training essential to those who plan to make conservation their life work, and the courses regularly offered permit specialization in many directions. A four-year course leads to the degree of bachelor of science. A shorter course is designated for the training of those who wish to take up game protection or become keepers of game preserves or game farmers.

The facilities for research, without which such courses could not have been developed to the high plane which they have attained, are equally strong, and offer the means for solving many of the State's still unanswered questions of wild life conservation.

The work in game farming. By Chapter 747 of the Laws of 1917, there was established at Cornell University, as part of the State College of Agriculture, and as an outgrowth of the work already developed, a state experimental game farm for the purpose of conducting investigations in the breeding and rearing of game and the giving of instruction in the same. The State has since invested approximately \$30,000 in facilities and has provided a staff and operating expenses for the work. The function of this experimental game farm is to conduct experiments in the propagation and management of game birds and mammals for food, fur, and sport. Seven specific investigational projects are now under way, which are basic in game breeding and rearing. They embrace problems in the selection of feeds; studies in heredity; the establishment of pedigreed strains; artificial hatching to multiply rate of reproduction; artificial rearing, including feeds and appliances; special feeding of selected breeding stock; and other studies in propagation. Incidental to the experimental work surplus stock is obtained, which is placed at the disposal of the State Conservation Commission, which cooperates in the work, for distribution. Provision is also made for public lectures, demonstrations, exhibits, field visits, and publications to make known to the public the results of experimental work on the game farm.

Game farming is conducted with economy at the State College of Agriculture because a large part of the necessary instruction in fundamental and applied biological science is already available as part of the agricultural curriculum: zoology, botany, entomology, physiology, bacteriology, chemistry, embryology, histology, mammalogy, ornithology, limnology, forestry, fish culture, farm management, animal husbandry, genetics, farm crops, and, in poultry husbandry, such subjects as incubation, brooding, diseases, sanitation, feeding, breeding, and housing. With the high development of the work in the broad fields of biology and poultry husbandry; with research specialists already on salary with work long under way; with excellent general and technical libraries containing the accumulations of a half century in these related fields; and with a farm already purchased by the State which provides superior advantages as regards shelter, quality of the soil, slope of the land, natural cover, air and water drainage, abundant vegetative and insect life, and perpetual streams of pure water, the opportunities for a high development of the fields of game farming and wild life conservation are unexcelled. In the field of resident instruction, more than one hundred students have taken courses in game farming during the past three years.

As the Federal Biological Survey is coordinate with other units in the United States Department of Agriculture, so are the biological activities involved in game breeding and rearing and fish culture coordinate with other activities in the State College of Agriculture.

The work in fish culture. New York State possesses exceptional water conditions for successful fish raising. When one considers all of the streams, springs, and swamp lands now going to waste so far as food production is concerned he wonders why the State has not heretofore undertaken the intensive study of these natural resources. Furthermore, there are few farms which do not have enough water of the right quality to supply one or more fish ponds. Calls which have come to the

State College for years have indicated that large numbers of farmers will undertake the propagation of fishes just as soon as information of the right sort can be given them. There is also a demand among students of agriculture for instruction in practical fish culture.

Before fish production can be materially increased, careful investigations must be undertaken for the following purposes:

(1) Devising methods for increasing the productiveness of our public waters. This problem is of national interest. In our own State it has been quite generally discussed among fishing club members and in the meetings of the New York State Fish, Game and Forest League. The general opinion strongly favors scientific investigation of our streams and lakes with the idea of improving them from the fisherman's standpoint.

(2) Improving wild fishes by selective breeding. Fishes are susceptible to the same improvement as were the wild cattle, wild horses, and the jungle fowl. Enough of this selective breeding has been accomplished with the carp to prove the assertion. Breeding of improved cultural varieties of our better native fishes offers a most promising field.

(3) Devising methods for rearing fishes economically to marketable size. This has not yet been done in America except by trout breeders and even they must obtain high prices for their products to make the investment pay. The chief problem here concerned is that relating to food. As soon as natural food can be propagated economically, it will be possible to reduce the price of trout. This likewise applies to any fish reared in the farm pond. The existing fish hatcheries raise fry. The raising of mature fish economically waits on the solution of the feeding problem and problems in fish pond management.

(4) The study of fish diseases, their prevention and their cure. It has been found lately that large numbers of wild fishes as well as those raised in hatcheries are afflicted with various diseases, including goiter and others of parasitic origin. Methods for preventing these must be created, if we are to get clean and wholesome fish in the future and if fish are to be raised in domestication.

In 1911 applied work in aquiculture was established, both teaching and research, and a small experimental hatchery was built in Cascadilla Gorge. A large amount of investigation has been done there to test the relative value of various artificial fish foods, and one bit of this work won for the investigator in charge last year the first prize of the American Fisheries Society for the best work in fish culture.

Reasons why the fish cultural work and studies in aquatic life should be extended at Cornell University include the following:

(1) The State has already a considerable investment in work that is now yielding returns. Aside from the staff of specialists and the biological field laboratory at the head of the lake, with an additional lot and boat house on the shore, the existing equipment consists of a fireproof experimental hatchery in Cascadilla Gorge, a large fish cultural experiment station building on Cascadilla Creek on the college farm, rowboats, seines, and other collecting apparatus, equipment for raising aquatic organisms, equipment for sampling wet soils and soil waters, and laboratory apparatus in limnology and aquiculture as well as highly developed facilities in the broad fields of zoology, entomology, and biology.

(2) The location at Ithaca is exceptionally fine for work because of two conditions:

(a) The natural environment, with every sort of fresh water from farm streams and marshes to deep lake water. The college farms are abundantly supplied with fresh water streams.

(b) The presence of experts in all related fields, whose knowledge and advice may be obtained when needed and without additional expense.

(3) The ownership of field station property.

(4) The ownership of twenty acres of land at the head of Cayuga Lake which is unexcelled for the development of the enterprise.

(5) The existence at the College of a laboratory of parasitology for the study of fish parasites.

(6) The existence of a state-wide extension teaching system to show the owners

of many thousands of acres of waste wet land how to make some of this land more productive than by draining and at less cost.

Relations with the State Experiment Station

In the annual report of last year, a statement was made of the affiliation with the New York Agricultural Experiment Station at Geneva. The benefits of the affiliation have already been felt, and additional steps have been taken during the year to make the affiliation helpful and effective. Members of the station staff have been in frequent conference with members of the college staff working in cognate fields. They have taken part in the seminars with advanced students. They have advised helpfully with graduate students, and in other ways have lent valuable aid to the College. Members of the college staff and some of the advanced students have had occasion to avail themselves of the privilege of using facilities of the state station. The College has also availed itself of the invitation to procure much of the laboratory material for the course in fruit varieties from the Geneva station, where the supplies are exceptionally rich.

On the other hand, the faculty of the Graduate School at Cornell University has altered some of its regulations so as to make it possible for young men in the employ of the state station, engaged in research under the supervision of affiliated members of the station staff, to register for advanced degrees in the University more advantageously than students who may desire to do part of their graduate work away from Ithaca elsewhere. There is a ruling of the graduate faculty, rigidly adhered to, that a student who finds facilities for research in some laboratory away from the University, may, on the recommendation of his committee, be granted permission to receive residence credit during one year for work done in such a laboratory, provided, however, that he shall receive no compensation from the owners of the laboratory, and that he shall have been in residence at the University for at least two terms prior to the granting of the privilege. The faculty waived the first of these provisos in the interest of the employed assistants at the New York Experiment Station. They may now draw their salaries from that institution while receiving residence credit here, but, like assistants in the University, may receive only three-fourths residence credit. With respect to the second provision, it also has been waived in the specific instances of two assistants at Geneva who had had a year of postgraduate study at another university but had no residence at Cornell prior to their applications to be allowed credit for work to be undertaken at once at Geneva. While this second provision is still operative, these actions of the graduate faculty indicate that it will be enforced only in the interest of sound graduate work. Members

of the Geneva staff who are also members of the faculty of the State College of Agriculture may serve on the committees of graduate students for either major or minor subjects. However, in order that the Dean of the Graduate School may keep in close touch with graduate students, it has been provided that a member of the faculty resident in Ithaca must also be on the committee for each subject and directly responsible to the Graduate School for the student's work in that subject. Under this arrangement, considerable direction of the graduate student's work can be given by an affiliated staff member located at Geneva.

The affiliation should prove increasingly intimate and helpful as time goes on. The agriculture of the State needs for its best development the largest service of both institutions.

The policy of the College with respect to commercial cooperative organizations

With the rapid rise of farmers' cooperative organizations for commercial purposes, the question arose as to what should be the policy of the College, as a state institution, toward the organization and operation of such agencies. The College is instructed by law to undertake such work, of an educational character, as shall "improve the agricultural methods of the State" and as shall aid "in determining better methods of handling and marketing such [farm] products." It is necessary, therefore, that the College recognize the dominant interest of farmers at the present time in cooperative or combined buying and selling, and that it be in a position to advise wisely in this important movement, having in mind the general public interest.

At the request of the Trustees, a committee of the staff was appointed to draft a statement of college policy in this matter. After thorough consideration, the following statement of policy was presented to the Trustees and approved by them:

The staff of the New York State College of Agriculture believes that cooperation when wisely developed will result in savings which benefit both the producer and the consumer. Therefore, as an educational institution supported by public funds to assist in the development of agriculture in the interest of the whole people, it is clearly a duty of the College to teach farmers the fundamental principles and practices in cooperation including:

1. Information as to the principles involved in true cooperation.
2. Advice as to best methods of financing.
3. Advice as to the producing or selecting of standardized products.
4. Aid on the problems connected with grading, packing, storage, transportation, and the like.
5. Assistance in determining costs.

Members of the staff, in so far as precedent in universities is concerned, have the right to hold offices in other organizations if their service to the university is not thus impaired. However, in the interest both of the College and of the organizations, we believe that it is not advisable for a member of the college staff to hold any office or be a director in a commercial cooperative association.

The School of Home Economics

Home economics was established as an extension enterprise in the College of Agriculture at Cornell University in 1900, twenty-one years ago. When the State established the State College of Agriculture in 1904 and assumed its support, it included the work in home economics. In 1907, in the further organization of the rapidly developing work of the College, the Trustees organized the work in home economics as a separate department of instruction in the College. In 1911 the State Legislature made an appropriation of \$154,000 for a home economics building, and subsequently authorized \$20,000 more for initial equipment. The State has continued to maintain and develop the work since that time.

The expenditure of public moneys in this work in connection with the University during the past year exceeded a quarter of a million dollars, distributed as follows:

State appropriations for resident and extension work..	\$90,730
Federal Smith-Lever funds for extension	57,066
Federal Smith-Hughes funds for teacher training.....	2,150
	<hr/>
Total	\$149,946

To these funds must be added the following, which are appropriated specifically for the purpose of cooperating with the State College of Agriculture in the extension service in home economics:

State Department of Farms and Markets	\$18,000
Appropriations of county boards of supervisors for county home bureau work for 1921	94,294
Voluntary contributions by rural women through mem- bership fees in county home bureau associations, 1921	22,486
Federal States Relations Service funds	3,444
	<hr/>
Total cooperative funds for extension teaching	\$138,224

Grand total of funds available in 1920-21 for the resi- dent and extension work in home economics which Cornell University administers wholly or in part..	\$288,170
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This is in addition to funds for heat, light, and water, and for printing bulletins and reports, which are undivided funds in the office of administration.

The staff now consists of seven professors, eleven assistant professors, fourteen instructors, and five officers in the administration of the home

bureau, junior extension, and related work, aside from the necessary clerical and other workers.

The enrollment of students taking the four-years course in home economics during the year 1920-21 was 271. General agricultural and other university students electing courses in home economics numbered 37. In the 1920-21 winter course, 39 were enrolled. In the 1921 summer school, 112 were registered. In all, 459 students received instruction in home economics during the year.

The teaching of home economics as a collegiate subject is yet relatively new, and it is still occasionally subject to the questionings which from the foundation of higher education have always been the lot of new departments of knowledge seeking entrance to the province of the universities for their fullest development and claiming public support. It is to be recalled that courses in science, now completely accepted, were developed in the older colleges as a grudging concession to the value of scientific work in a general cultural education. Because of its lack of traditional acceptance, it is as easy to disparage the art of costume design, the selection of textiles, and the care and feeding of human beings, as it was only a brief while ago to disparage the art of housing design, the selection of materials of building or machine construction, or the life habits of animal species. It is yet difficult to overcome the suspicion that because the art of costume design, for example, is finally made effective by the application of sewing and millinery, it is essentially of lower cast than the art of building design which is made effective for human use by the application of carpentry and masonry, or the art of machine design which is finally expressed in blacksmithing and forging and other mechanical operations. Subjects which involve somewhere in their teaching or application simple mechanical routine have always been met with doubt or rebuff when first they asked for a fair opportunity in the educational system.

The chemistry, utility, and reactions of foods are quite as scientific problems and as important to mankind as the chemistry, utility, and reactions of drugs; only we have been slow in realizing the fact. The training of dietitians of a highly expert character will never be accomplished in any educational system of less than college grade. With the development of physical chemistry, problems in the preparation of food, such as the physical changes in the cooking of sugars, are of immediate importance. The effect of temperatures of varying degrees in the cooking process is being shown to have an intimate bearing on nutrition. There are rich fields of investigation in the relation of the fundamental structure of plant tissues to cooking processes; the physics and chemistry of textiles;

the physics and mechanics of household equipment; the economics of consumption; the bacteriology of household and institutional sanitation; the art of interior decoration. Physiological studies as to the influence of various kinds of clothing are needed. Economic studies of the problems of home and institutional management are quite as far-reaching as other sorts of economic study. Furthermore, home economics is concerned not alone with the problems of individual homes, but quite as much with the complicated managerial problems involved in the house-keeping of institutions of all sorts.

There are three laws which place responsibility for the development of home economics on the New York State College of Agriculture at Cornell University:

(1) The Administration Act of the College, Chapter 218, Laws of 1906, which specifically charges the College of Agriculture with the three-fold function of offering resident instruction, making researches, and conducting extension work.

(2) The Federal Smith-Lever Act of 1914, appropriating exclusively to the land-grant colleges vast sums for cooperative extension work in agriculture and home economics between these colleges and the United States Department of Agriculture. These funds are provided in annually increasing increments, and require state offset in substantially equal amount. When these funds shall have reached their maximum, in 1923, the annual receipts by Cornell University as the land-grant institution under this law, including the required state offset, will approximate \$330,000. In this bill, agriculture and home economics are recognized coordinately. By act of the Legislature, the provisions of the Smith-Lever Act were accepted by the State, and this institution was designated to carry out the provisions.

(3) The State Farm and Home Bureau (County) Law, which authorizes county boards of supervisors to appropriate money:

For the general improvement of agricultural and home conditions and for the support and maintenance of county farm and home bureaus to conduct demonstration work in agriculture and home economics * * * * *

For the purpose of this act there shall be recognized in each county of the State which shall qualify under this act to cooperate with the State College of Agriculture and the Department of Farms and Markets in conducting the work provided for in this act, a public county association known as a county farm and home bureau association * * * * *

There shall be annually appropriated out of any moneys in the treasury not otherwise appropriated * * * the sum of five hundred dollars (\$500) per annum for home economics for each county in the State which shall qualify as required by this section.

This law further provides:

The general supervision of the cooperative agricultural and home economics extension and development work herein provided for shall be under the joint

direction of the Commissioner of Agriculture and the Dean of the New York State College of Agriculture through a representative to be known as State Leader of County Agents, mutually agreed upon * * *.

On the basis of these laws, thirty counties and three cities—Buffalo, Rochester, and Syracuse—have qualified and are organized with county or city home bureau associations for cooperating with the College and the state and federal departments in home economics extension. The State is pledged to complete the organization of the counties of the State whenever they shall qualify.

In addition, nine county boards of supervisors last year made additional appropriations for junior extension (so-called boys' and girls' club work) in home economics, with every reason to expect that within a few years this work also will receive county funds in every county of the State, as it has commended itself highly. It is now conducted in forty-four counties of the State and twenty-three counties have more or less definite county-wide organizations for its promotion.

The number of persons cooperating locally in the home economics extension follows:

Total membership of women in home departments of county farm and home bureau associations June 1, 1921	22,486
Number of girls and boys regularly enrolled in junior foods and clothing projects	5,500
Number of women enrolled in 113 Cornell study clubs.....	3,203
Number of women on mailing lists, by request, to receive the available extension publications	69,503
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Total	100,692

In addition, the College mailed last year 394,420 bulletins on home economics to individual readers.

The maintenance of this extension service necessitates a strong background in teaching and research at the College. Its rapid growth as a voluntary expression of the people has been one of the most difficult and trying circumstances with which we have had to deal. Our greatest single weakness is that as yet we have been able to develop no organization here for research in home economics. A bill now before Congress, if it becomes a law, will make the development of home economics research possible, if in the meanwhile we do not obtain relief from the State at this point. Extension teaching implies something to extend, and it cannot long be sustained unless there is substantial development of knowledge back of it. If the State and the University are to safeguard their re-

sponsibilities for high-grade teaching, they must of necessity adequately develop the fundamental work at the institution.

The question of industrial fellowships

I desire to call attention to a matter of general interest in university circles, namely, the acceptance of funds for the establishment of graduate fellowships in research, from industrial corporations, farmers' organizations, and the like.

The College of Agriculture has now, for many years, accepted grants of money from farmers' organizations and from industries serving agriculture, for the investigation by graduate students, as an important phase of their graduate work, of problems in farming or in the industry in which the donors are particularly interested. In all, more than fifty industrial fellowships, as they are called, have been received by the College. Their acceptance has been on the basis of a careful memorandum of agreement with the donors, approved in each case by the university attorney. While the experience of the College has been wholly satisfactory and no objectionable features have developed, it seemed wise to the Agricultural College Council to request the Dean to appoint a committee from the staff to consider the questions involved from the standpoint of the University, and to report whether it seemed desirable to make any changes in the existing practice, in order to protect the name and the primary interests of the University. The report of this committee, made to the Council on April 29, 1921, is reprinted herewith:

April 21, 1921

The committee which was asked to study the problems of industrial fellowships reports its conclusion that within the field to which they are naturally restricted these fellowships constitute a valuable means of increasing the amount of research work that can be undertaken and that therefore the College should by no means refuse this form of cooperation or restrict its application without well-defined reasons. We indicate what seem to us to be the limitations in the applicability of these grants and mention some attendant dangers which should be kept in mind. We agree that such dangers as may be inherent in the plan have not become apparent in the experience of the College covering a period of several years during which more than fifty of these grants have been administered.

The most obvious danger to which industrial fellowships might be considered subject is that the investigator may be under pressure to go into phases of his problem or to do a type of work which may not be most essential from the educational point of view. As showing how completely the graduate faculty has safeguarded this the resolutions adopted by that faculty on April 22, 1920, are here included:

1. Appointments to industrial fellowships should be made by the faculty of the Graduate School on the recommendation of the group of teachers concerned, in the same way as appointments are made to other fellowships. Whenever possible, these fellowships should be thrown open to competition.

2. If the holder of an industrial fellowship is a candidate for an advanced degree, the terms and the conditions under which the fellowship is given should be submitted for approval to the General Committee of the Graduate School.

3. It is undesirable that the stipend attached to these fellowships should be greater than is sufficient to support a student during the term of his appointment, and it should never be considered as of the nature of a salary for services rendered to the individuals or firms who have endowed the fellowship.

4. In all decisions regarding the acceptance of industrial fellowships, the educational advantage of the students concerned should be the chief consideration. No investigations should be undertaken under the name of graduate work whose interest is primarily commercial and which do not have a direct relation to fundamental scientific principles.

5. No arrangement should be entered into with any individual or firm in regard to the endowment of a fellowship by the terms of which it is stipulated that there shall be delay in the publication of results, or any conditions imposed that are not consistent with the requirements in regard to theses that have been accepted for the degree of doctor of philosophy.

6. Voted, that nothing in the resolutions above stated is to be construed as in opposition to the acceptance by the University of grants by an industry for the investigation of technical problems of that industry; but that such a grant shall not be classed as endowment of a fellowship or fall under the jurisdiction of the Graduate School, unless the investigation is being carried on by a student registered in the Graduate School and may be used by him in partial fulfillment of the requirements for an advanced degree.

A second danger lies in the fact that industrial fellowships may be urged upon the College partly from a desire on the part of the donors to secure an advertising advantage from an investigation conducted by the College. This danger has not been realized in our experience; on the contrary, industrial concerns have shown a willingness to give all reasonable guarantees of good faith in this respect. The memorandum of understanding under which a fellowship is administered can obviate possible difficulty by explicitly indicating how the results of the investigation are to be published.

There is further some apprehension that the acceptance of grants for industrial fellowships may arouse distrust among farmers of the disinterested purposes and freedom from bias of college officials in investigations carried on for industrial concerns. This point of view is reflected in the statement by the dean of a middle-western agricultural college to the effect that he would not think of accepting money from the Chicago packers for an economic study of the beef industry while he would take all they would give for a study of tuberculosis in cattle. This consideration is of such weight as to suggest caution in entering upon arrangements likely to precipitate criticism, but it does not, in the opinion of this committee, justify the College in abandoning the position that it stands ready to help solve problems in the field of agriculture irrespective of the groups by which such problems are presented. There is of course every reason to weigh the relative urgency of the problems whose solution is suggested but progress in the knowledge of agriculture rather than fear of criticism should determine our decisions in these matters.

Finally, it may be suggested that there is danger in creating the impression that the College must promptly give its attention to a problem of interest to any group which offers to furnish the funds needed for the investigation. The agriculture of the State will probably profit most by the investigations of the College if each department or group of investigators will determine upon rather broad fundamental lines of research and in so far as practicable focus most of their study upon these lines until somewhat definite results are obtained. Nothing is better calculated to interrupt work of this sort than to have to respond to the demands of every group that urges its special interest whether or not it constitutes a real emergency.

It may be observed that the field in which industrial fellowships will properly develop has certain natural limitations. Obviously such fellowships will not be available for an attack upon the broader fundamental problems which have no immediate, well-defined, practical bearing. In some fields of agricultural research the more obvious problems have been studied and the unsolved problems are so remotely related to practice that they do not interest the farmer even though their solution is essential to further improvement in practice. Even among those problems which do have an immediate, practical bearing there is a great range in the dependability of the results likely to be obtained. In some investigations it is

reasonable to expect that the findings will be precise, clean-cut, and reliable. In others the nature of the controlling factors may be such that the results will necessarily be undependable under the varying conditions of practice. It would seem to be the part of wisdom to accept grants only for investigations whose results promise to be relatively clear and dependable.

From still another point of view it may be urged that the use of industrial fellowships will be progressively restricted. It seems likely that in the long run more will be accomplished for agriculture if the funds available from private sources are used to employ trained investigators, men who have completed their graduate work. The salaries to be paid would need to be greater but the returns would likewise be greater. This is the method followed in industrial laboratories and it would seem a desirable development in agriculture as well.

Having stated the dangers inherent in industrial fellowships and the limitations of their applicability, the committee is nevertheless of the opinion that the policy now in force should be continued. We regard the safeguards against the dangers as adequate and we recognize that where applicable these scholarships not only greatly increased the amount of research that can be accomplished but they yield to the student the advantage that accrues from work upon problems of vital interest in the situations where they actually arise.

THE EXTENSION ACTIVITIES

The outstanding features of the extension work of the College during the fiscal year ended June 30, 1921, have been the continuation of sound teaching on the various phases of agricultural production, increased attention to the economics of agriculture and to the standardization, handling, and marketing cooperatively of the products of the farm, the inauguration of extension projects in the social phases of country life, the celebration of the tenth anniversary of the inauguration of farm bureaus in the North and West, increased emphasis on the analysis and the systematic programming of farm bureau work, expansion of the home bureau work, and the growth of extension school work.

Field meetings

Outstanding features of the Extension Service during the academic year just closed are in line with the increasing importance of the economics of agriculture and the social phase of country life, as pointed out in the annual report for last year.

The sharp decline in prices of nearly all farm products, more rapid than that of farm machinery, fertilizers, and other equipment materials, has centered attention on savings and economy needed both in marketing and in production. These necessities have found expression in a wave of cooperative enterprise, in which the College has been called upon for counsel and advice, our function being to present fairly both sides of cooperation as a means of effecting savings, particularly through careful grading and packing and standardizing and improved uniform quality, and to supply cost-of-production figures. Work of this sort has been done with the canning-crop growers, the producers of maple sap products,

fruit growers, potato growers, dairymen, poultrymen, and some other groups.

In the purchase of fertilizers, tremendous savings to farmers have been made possible by a wide distribution of facts concerning relative values of materials on the market and information on the possibilities of home mixing of various single ingredients.

A promising field was opened up in two conferences arranged by the College between country merchants, and farmers and their wives. The aim is to bring about a better understanding between buyer and seller, to improve credit conditions and merchandising methods, and to develop better taste in choice of merchandise.

Farm and home institutes held this year were fewer by nearly 35 per cent than in the winter of 1919-20. There was also a smaller total attendance, although the average attendance was 21 per cent higher than last year. The character of the programs did not differ materially from that of last year. The comparative reports from the field indicated a high grade of work done and a growing demand for the all-day type of meeting.

The following tabular statement gives the numbers of meetings of various kinds, exclusive of schools, held from July 1, 1920, to June 30, 1921, together with the attendance:

	Number of meetings	Attendance
Demonstration meetings	996	52,941
Lectures by specialists	1,402	111,026
Conferences and conventions	1,080	18,630
Inspections	4,611	
Farm and home institutes	247	21,791
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Total	8,336	204,388
Number of man-days in the field		4,694

On the whole, attendance and interest at meetings during the past year have been entirely satisfactory, the average attendance being somewhat larger than last year. It should be borne in mind that "man-days in the field" is exclusive of time spent in travel to and from headquarters; in other words, it is the net days of constructive work in the field. The total number of personal contacts made, including schools, institutes, demonstrations, inspections, and the like, but exclusive of Farmers' Week and Farmers' Field Days at the College and persons reached at fair exhibits, was 226,528.

Extension schools in agriculture

The total number of extension schools held in the winter of 1920-21 equals the highest previous record, that of the winter of 1915-16, while the total enrollment, 1,919, is exceeded only by that of 1915-16, which was 1,970.

Approximately 80 per cent of the schools held last winter were of three days each, as compared with about 65 per cent of this type of school in the previous year. While the three-days schools have been very popular, a thorough trial indicates that their best use is limited to groups of persons having in high degree a common interest, as, for example, potato growers. The gas-engine schools and the farm-mechanics schools, which have been largely of three days duration, have proved too rigorous for students and instructor alike, and next year the schools will in the main be lengthened to four or five days, exceptions being made, if at all, in communities where similar schools have been held recently.

It is worth noting that the cost to the College of operating schools has been gradually reduced. The average number of instructors at schools last winter was 2.06, the smallest to date. While the fees from one or two 1920-21 schools have not at this writing been received, the estimated cost to the College of each school, exclusive of salaries, is \$25.19, as compared with \$29.43 in 1915-16, the previous low record.

A summarized statement relating to the extension schools follows:

Number of schools held	59	
Number of three-days schools	50	
Number of five-days schools	9	
Counties reached	29	
Total enrollment	1,919	
Average enrollment	32.52	
Largest enrollment	59	(Horseheads)
Smallest enrollment	11	(Port Leyden)
Highest percentage of attendance	96.36	(North Rose)
Average attendance for each session	22.98	
Average number of instructors to each school	2.06	
Length of school season (weeks)	17	

Farmers' Week

The Fourteenth Annual Farmers' Week, held February 14 to 19, inclusive, was the largest in attendance since Farmers' Week was started, in 1908. The total registration this year was 4,116, indicating an attendance probably approximating 4,800. The largest previous registration was 3,763, in 1919. The registration this year represented 58

counties in New York State, and 23 other States and Canada. Fifty-five persons were registered from Pennsylvania, 21 from New Jersey, and 10 each from Massachusetts and Connecticut. Of the counties in New York, Tompkins led with a registration of 1,482, Cayuga was second with 262, Tioga third with 220, and Seneca fourth with 204. In the Tompkins County registration only 405 were from the city of Ithaca, the remainder being registered from the county at large. Undoubtedly the unusual weather conditions, making possible the use of automobiles, swelled the registration from the near-by counties. The program, made up of 293 lectures, 77 demonstrations and round tables, 8 speaking and judging contests, 56 practice periods, 15 conferences, 40 subject exhibits, and 13 banquets and concerts, was similar in arrangement and subject matter to those of previous years, possibly with more emphasis on marketing problems. Demonstrations, round-table discussion periods, and conferences were emphasized.

Farmers' Field Days

Farmers' Field Days, held for the first time last year, were repeated this year on June 23, 24, and 25. Although the attendance was not so large as last year, the interest was excellent. The forenoon of each day was given over largely to tours of the campus and the farms, organized with a definite route and stops, with guides to indicate points of interest. Demonstrations and inspection trips to the fields, the orchards, and the barns were planned for the remainder of the forenoons and for the afternoons.

The attendance was conservatively estimated at 400 on Thursday, 1,000 on Friday, and 600 on Saturday, a total of 2,000.

State Fair

As usual, the contribution of the College to the State Fair at Syracuse was large and varied, and touched nearly every important department of the fair.

The Cornell exhibits were located, as formerly, in several buildings. The main part of our exhibits, in the State Institutions Building, comprised contributions from the Departments of Forestry, Poultry Husbandry, Dairy Industry, Rural Social Organization, Landscape Art, and Farm Management, the School of Home Economics, the Office of Publication, and the State College of Veterinary Medicine.

In other buildings the College staged dairy-manufacturing and milk-testing demonstrations, junior extension exhibits with daily demonstrations by girls and boys, poultry housing, artificial lighting for egg pro-

duction, a floral exhibit, and an exhibit of farm and home products from Indian reservations. One of the best single features of our contribution was the Little Country Theater, which was packed to the doors at nearly every performance.

County fairs

In an effort to aid local fair associations to improve the quality of their exhibits, to rid them of undesirable features, and to add to their educational value, the College has had a committee at work on suggestions along these lines, with particular attention to the revision of premium lists. The recommendations of this committee have already been incorporated, in part at least, in many of the new premium lists.

Thirteen exhibits were sent to 10 county and town fairs in 10 counties, and judges, mainly for cattle, sheep, poultry, swine, potatoes, and apples, were sent to 16 fairs, a total of 22 fairs being reached in 17 counties.

Extension work with Indians

Chapter 662 of the Laws of 1920 authorized the Extension Service of the College to enlarge its field of activities so as to include 6,500 Iroquois Indians residing on the 87,000 acres embraced within the Indian reservations of the State.

Sixteen councils of Indians were held to obtain their official sanction and cooperation, and contacts were made between the chiefs, the farmers, and the housewives of the various tribes of the Six Nations, and the county agents, their assistants, and the officials of the farm and home bureaus of the counties adjacent to the reservations. Indian farmers attended annual and advisory committee meetings, and an attempt was made to incorporate the program for each Indian reservation in the annual program of its respective farm bureau. It was felt that a clear understanding of the purpose and program of each bureau was essential, as well as the recognition that the Indian farmer must himself adjust the program to the needs of his own agricultural community. This recognition of the Indian's right to determine the method of solving his agricultural problem has produced good results, and with returned Indian short-course students participating in the annual meetings of 1922 a better-balanced program will doubtless be projected.

An exhibit contributed by five of the six reservations was staged at the State Fair; three reservations exhibited at their county fairs; and the College, in conjunction with the Erie County farm and home bureaus, put up an instructive and largely patronized exhibition tent at the annual fair of the Iroquois Agricultural Society on the Cattaraugus Reservation.

The premium list of this fair is now being revised by the Erie bureau so that the fair may become more educational in character.

A series of 46 winter and spring meetings, with an average attendance of 38, was held on the several reservations, orchard and poultry demonstrations were staged, and a farm and home institute and a barn meeting were held.

Six Indian boys and three Indian girls selected by the Indians came to Ithaca during the short winter courses in agriculture and home economics, and all six boys are now either officers or in responsible positions in the agricultural societies of the reservations. These nine students were developed with the idea of service to their communities, and, being selected by their own people, they have a deep feeling of obligation to their home folks.

Forty adult farmers and housewives from the six reservations spent Farmers' Week at the College, with wonderful results both to the Indians and to the future program of the College. These Indian people understand the policy and attitude of the College toward them, and a fine spirit of cooperation followed their visit.

To meet the demand for better seed, community plots, operated by the Indian farmers in cooperation with the bureaus and the College, are being carried on with success, and demonstration plots of corn, beans, and potatoes have been established on the reservations. In these plots the Indian maize, considered by the Indian so sacred and valuable, is competing with the white man's varieties for popular favor in Indian country.

Community tractors are in operation on two reservations, a branch of the Dairymen's League has been organized on one, a campaign for the eradication of tuberculosis is in full swing, and an agricultural course in an Indian school is about to be inaugurated. Cooperation in all lines is the watchword.

Two women's units have been organized under the home bureaus, a milk program has been successfully handled by the Indian women, a "food for babies" project has been carried out with good results, and a wide range of better home-making knowledge has been brought to the reservations. A group of Indian women under the leadership of a short-course Indian girl has demonstrated homemade dress forms in a white community off the reservation, and a group of Indian women from another reservation has prepared an Indian cooking demonstration for a white community. This recognition of the fact that the Indian farmer and housewife have something to contribute to the program of the whites is an important factor in developing future cooperative relationships.

The part that Indian farmers and their wives are taking in the development of a program in agriculture and home making, including the junior projects, their attendance at meetings, at Farmers' Week, at fairs, and at farm bureau conferences, their readiness to enact a corn-borer quarantine regulation on one reservation, and their eagerness to try new methods in comparison with their own, are all indications that the time is ripe for the carrying-out of a carefully planned farm and home program in which the Indians' own plans, wishes, and capacities shall be fully considered.

Publications

The principal advancement during the year was the taking-over of the farm study courses, or correspondence courses, which have been enabled to offer a stronger appeal, largely because of the faculty's authorization of a certificate for the completion of advanced courses. With the experience gained during the past year, the correspondence courses promise to develop rapidly during succeeding years. However, they will be held back during the next year because of the curtailment of appropriations for agricultural bulletins.

Provision of home study. Since their reorganization on July 1, 1920, the home study courses have been clearly divided into two classes: the Cornell farm study courses proper, which consist of a consecutive series of bulletin lessons sent one at a time to students, as answers to questions on previous ones are returned; and the advanced study courses, or correspondence courses proper, in which mimeographed lessons and laboratory outlines are based on a textbook which the student purchases. Papers in the advanced study courses are marked by members of the staffs of the subject-matter departments, and a final examination is a part of each course.

During the year, Cornell farm study courses have been started in the eight subjects offered, by 1,856 residents of the State. The subjects are farm crops, the soil, home gardening, fruit growing, dairying, livestock, flower growing, and poultry. An arrangement perfected with Congressman A. B. Houghton has enabled the study courses to procure such farmers' bulletins as were needed, and twenty-four separate farmers' bulletins have been thus used, in addition to thirteen separate bulletins and circulars from the Geneva station and the available Cornell extension and reading-course bulletins. Questions have been prepared and sent out with all the bulletins, in addition to the questions regularly printed in the reading-course bulletins. A total of 5,027 publications have been distributed in the Cornell farm study courses during the year.

The advanced courses. Three advanced courses, in farm crops, vegetable gardening, and fruit growing, respectively, were offered a year ago. Two more have since been added, in poultry husbandry and farm management. During June, 1920, eight lesson papers for advanced courses were received; during the same period of this year, 70 advanced answer papers were sent to the College to be marked, of which 40 were in the original three courses offered a year ago. During the year, 102 persons have registered for the five advanced courses and 492 lessons have been sent out. In answer to a suggestion that winter-course students might keep their connection with the College by means of the advanced courses, 27 students of last year's winter course registered for the study courses. Many study-course students have also written for information about the winter courses.

Statistics compiled in April from the enrollment records of the advanced study courses, showed that 90 per cent of the students are getting actual benefit on the land from their study. Farm owners, owners' sons, hired men, and tenants make up 59 per cent of the students, while 23 per cent are professional men, many of whom own farms, and 18 per cent are skilled laborers. A large majority of the students are between twenty and forty years of age; 60 per cent have had high school training or one or more winter courses at the College; 22 per cent are college graduates; 19 per cent have had no high school education.

Agricultural journalism. Four courses in agricultural journalism are now included in the Department of Extension Teaching. These courses are largely intended for extension workers; however, they have served a useful purpose in fitting for their tasks, writers on agricultural and home economics subjects, and graduates of the courses are already filling important places in this field. To the original course in agricultural journalism, which has been made a three-hours instead of a two-hours course, have been added two-hours courses in the country weekly, in agricultural news writing, and in advanced agricultural information. To these will be added in the coming winter course, or short course, a two-hours course on the rural press.

The news sent to country weeklies has been more widely used than heretofore, and during the past year the news items issued by the College have had an actual known circulation of more than twelve million a month. This has grown since 1915, when the news service was started.

Some investigations. Two surveys have been undertaken in regard to the country-weekly situation in New York State, and these may lead to a further publication on the subject. A further survey to discover what reading matter finds favor with farmers is planned for the coming year.

Publications hampered. Much of the publication work itself, and a great deal of the extension work which depends upon it, has been disadvantageously affected by the fact that many new publications which were ready for printing could not be issued during the preceding fiscal year, a large part of the appropriation having been taken up by the high cost of printing and by the necessity of having reprints made of many of the bulletins which were destroyed in the warehouse fire of July, 1919. Practically all these reprints have been made, and the beginning of the fiscal year finds 27 publications waiting for the new appropriations of 1921-22 to pay for their printing.

Distribution of bulletins. In the distribution of publications, there were sent from the mailing room during the past fiscal year 1,487,468 pieces of matter, and a considerable proportion of this was in response to definite requests. An average of more than a thousand bulletins a day were sent in response to specific queries for information.

The college mailing list now contains 130,244 names, classified except for the home economics bulletins. A comparison with the distribution systems of other similar institutions, including that of the United States Department of Agriculture, indicates that the system now in use at the College is second to none.

Publications issued. During the year the College issued 34 new publications, with 1,768 pages, besides the regular monthly periodicals edited and published in the Office of Publication—the *Extension Service News* for extension workers in all parts of the State, and the *Service Sheet* for country publishers.

The comparatively small number of publications as compared with the fiscal year ending June 30, 1920, when 93 bulletins, with 6,716 pages, were issued, is due to two factors: first, printing costs of 1920-21 were higher than in the preceding year; and secondly, in the preceding year the College had an additional emergency fund for printing, over the regular appropriation. In the coming year, with a 25-per-cent reduction in funds for printing and without reduction in costs, except for paper in large editions, all the work of the College dependent largely on published matter will be hard hit, a situation which vitally affects the service the College is able to render.

These publications constitute a regular part of the annual report of the College and are issued separately as bulletins in various series. Copies of any of them may be obtained on application to the Office of Publication, College of Agriculture, Ithaca, New York, as long as the supply lasts. The list of publications follows:

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
39 The genetic relations of plant colors in maize (Plant Breeding)	156	4,500
Total	156	4,500
EXPERIMENT STATION BULLETINS:		
403 Raising colts (Animal Husbandry)	49	12,000
Total	49	12,000
READING-COURSE LESSONS FOR THE FARM:		
117 (Reprint) Computing rations for farm animals (Animal Husbandry)	68	3,000
135 (Reprint) The farm ice supply (Rural Engineering) ..	24	5,000
136 (Reprint) The beef breeding herd in New York State (Animal Husbandry)	24	5,000
137 (Reprint) The dairy herd (Animal Husbandry)	24	5,000
139 (Reprint) Swine production in New York (Animal Husbandry)	36	5,000
Total	176	23,000
READING-COURSE LESSONS FOR THE HOME:		
134 Household insects (Entomology)	45	20,000
135 Fireless and steam-pressure cookers (Home Economics)	43	85,000
136 Food preservation (Home Economics)	86	85,000
137 The home laundry (Home Economics)	46	5,000
138 Saving strength in the household (Home Economics) ..	20	5,000
Total	240	200,000
EXTENSION BULLETINS:		
9 (Reprint) Gladiolus studies—I. Botany, history, and evolution of the gladiolus (Floriculture)	100	2,500
11 (Reprint) Gladiolus studies—III. Varieties of the garden gladiolus (Floriculture)	180	5,000
19 (Revised reprint) Control of vegetable diseases (Plant Pathology)	31	5,000
21 (Reprint) How to select laying hens (Poultry Husbandry)	16	10,000
30 (Reprint) Country milk stations: their function, organization, operation, construction, and equipment (Dairy Industry)	32	3,000
*41 Mail study courses in agriculture (Publication)	12	5,000
42 Community songs (Rural Social Organization)	36	30,000
43 Directions for cleaning and care of milking machines (Dairy Industry)	8	20,000
Total	415	80,500

* Dated May, 1920, but omitted from report for 1920.

RURAL SCHOOL LEAFLETS :

September, 1920 (Rural Education)	120	20,000
November, 1920 (Rural Education)	40	150,000
January, 1921 (Rural Education)	58	100,000
March, 1921 (Rural Education)	63	100,000
Total	<u>281</u>	<u>370,000</u>

JUNIOR EXTENSION BULLETINS :

1 (Reprint) First lessons in sewing (Home Economics)	44	10,000
2 (Reprint) Elementary garment making (Home Economics)	28	10,000
Total	<u>72</u>	<u>20,000</u>

MISCELLANEOUS :

Program for fourteenth annual Farmers' Week, February 14-19, 1921	32	14,000
Farmers' Field Days at Cornell	24	7,000
Information for students	35	750
Total	<u>91</u>	<u>21,750</u>

ANNUAL REPORT FOR 1920

83	5,000
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ANNOUNCEMENTS :

Announcement for summer term, 1921	28	1,500
Announcement of courses, 1921-22	89	12,500
Announcement of winter courses, 1921-22	39	10,000
Total	<u>156</u>	<u>24,000</u>

SUMMARY

	Total number*	Total pages	Copies
Memoirs	1	156	4,500
Experiment station bulletins	1	49	12,000
Reading-course lessons for the farm	5	176	23,000
Reading-course lessons for the home	5	240	200,000
Extension bulletins	8	415	80,500
Rural school leaflets	4	281	370,000
Junior extension bulletins	2	72	20,000
Miscellaneous	3	91	21,750
Annual report	1	83	5,000
Announcements	3	156	24,000
	<u>34</u>	<u>1,719</u>	<u>760,750</u>

Farm bureaus

In March, 1921, the farm bureau movement completed the ten-years mark of service in New York State. Broome County was the first county to start the work, and the occasion was celebrated on March 21, at Binghamton. Representatives of the United States Department of Agriculture, the New York State College of Agriculture, the Binghamton Chamber of Commerce, the Lackawanna Railroad, the American Farm Bureau Federation, the New York State Federation of Farm Bureaus,

* Including reprints.

the New York State Federation of Home Bureaus, county agents, and others, were in attendance.

As the farm bureau movement has progressed, farmers have accepted a greater degree of responsibility and each year have been paying a larger percentage of the costs. The membership is now in a transitional stage. In 1920 the farm bureau membership stood at 55,776, and on June 30, 1921, at 47,207. This slight decrease is due to two factors: first, the economic condition in which farmers find themselves has reflected itself on the membership; and secondly, the fees have been materially raised in many of the counties. Five counties have adopted a straight \$5 fee, while a much larger group of counties has the sliding-scale plan, their fees ranging from \$2 to \$10. The State Federation has recommended to the counties that a uniform fee of \$5 be adopted for 1922.

Work of the bureaus clearly educational. Farmers have demanded that assistance be given them in marketing work. The bureaus in New York State have held strictly to the principle that they are created for educational purposes and it is not their function to carry on commercial transactions in any way whatsoever. This does not mean that their efforts must be confined to crop production, as it is as much the function of the county agent to give information relative to marketing as to give information relative to production. County agents have therefore been free to advise with farmers and farmers' organizations regarding cooperative enterprises.

The work of the State Federation of Farm Bureaus has been clearly differentiated from that of the educational institutions, but there has been close cooperation. The State Federation has progressed to a point where a permanent secretary is now employed and is available to look after the interests of the organization that he represents.

Farm and home bureau finances. During the calendar year 1920, the farm and home bureau associations, including 55 farm departments and 26 home departments, obtained, in round numbers, \$536,000 as funds from local sources. In addition to this amount, they received a total of \$45,750 from the New York State Department of Farms and Markets and \$52,203 from the college federal Smith-Lever funds, which makes a grand total of nearly \$634,000 available for the work.

Summary

A statistical summary of the field contacts of all extension specialists, State leaders, and county representatives, is given in the following table:

SUMMARY OF FIELD ACTIVITIES OF EXTENSION WORKERS

Agriculture

Type of activity	Number of persons reached
Extension schools, 59	17,529
Institutes, 247	21,791
Lectures, 1,408	112,361
Demonstration meetings, 996	52,941
Conferences, 1,080	18,630
Farm visits and inspections, 4,611	4,611
Farmers' Field Days, 3	2,000 (est.)
Farmers' Week, 1	4,116
Exhibits at State Fair and at county fairs, 264 days	No record
Special field assistants, 5,343 visits, etc.	13,420
Total	247,399

Home economics

Extension schools, 27	3,336
Institutes, 221	7,705
Lectures, 525	40,198
Demonstration meetings, 363	12,865
Conferences, 169	2,565
Inspections, 10	10
Exhibits at State Fair and at county fairs, 78 days..	No record
Total	66,679

Agricultural agent system

Lectures, committee meetings, and conferences by state county agent leaders, 645	16,454
Meetings, demonstrations, etc., organized or ad- dressed by county agents and assistants, 39,748...	476,641
Total	493,095

Home-demonstration agent system

Lectures, committee meetings, and conferences by state home demonstration agent leaders, 208.....	21,172
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Meetings, demonstrations, etc., organized or addressed by home demonstration agents and assistants, 8,887	274,409
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Total	295,581
Junior extension system	
Lectures, meetings, and conferences by state junior extension leaders, 627	15,383
Meetings, demonstrations, etc., organized or addressed by junior extension leaders and assistants, 11,849	71,349
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Total	86,732
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Grand total of personal contacts	1,189,486

Agricultural Chemistry

The extension work of the Department of Agricultural Chemistry has consisted of lectures at community meetings and institutes, the analyses of 160 samples of miscellaneous products received at the extension laboratory, and the publication of two bulletins on cider and vinegar prepared by Professor F. E. Rice. Soil samples are now analyzed in the soils laboratory. Other samples received consisted of limestone, feeds, insecticides, fungicides, cases of suspected animal poisoning, vinegar, and other products.

Agricultural Economics and Farm Management

The important developments of extension work in agricultural economics and farm management during the past year were the systematic development of the work under the direction of Dr. C. E. Ladd, and the continuation of lines of work mentioned in previous reports.

The farm management specialists gave 108 lectures to 7,501 persons, taught in 4 extension schools with a total enrollment of 535, took part in 79 conferences and conventions with an attendance of 1,121, made 375 inspections and visits to farms, and took part in 2 demonstration meetings with an attendance of 200.

The farm management surveys in the town of Newfane, Niagara County, were continued for the eighth year, and results were returned to 175 farmers. In Livingston County the results of 724 records taken in 1920 were returned to the farmers.

An advanced reading course in farm management was prepared and published. Before the end of the year ten persons had enrolled for this course.

Other extension activities include the preparation of a new farm-account book approved by the American Farm Bureau Federation and by the United States Bureau of Internal Revenue for income tax purposes, of which 2,800 copies have been sold to farmers at cost; the supervision of cost-account keeping on 36 farms where the work was completed this year, and the starting of 44 accounts for the coming year; the taking of 355 survey records on the cost of producing canning-factory crops, and the closing of 100 single crop account books for growers of canning-factory crops; and the return of 163 records of the cost of producing milk on farms in Herkimer County.

Animal Husbandry

The extension work of the Department of Animal Husbandry has been continued along lines similiar to those of previous years. In the absence of Professor H. A. Hopper on sabbatic leave, Professor C. H. Royce carried the general responsibility for the extension work of the department.

As heretofore, there was extension work for the improvement of the dairy herd, the better utilization of farm-grown feeds, the purchase and mixing of concentrated feeds, and the supervision of the advanced registry records of dairy cows. This last phase of extension work requires the services of from thirty to one hundred supervisors, depending on the season. During the past three years, 3,375 official seven-days records have been supervised for more than 400 breeders, and 1,025 cows have been carried on monthly inspection for 160 breeders.

The dairy-improvement work of the past year has been continued. There was a decrease in this work early in the year due to the financial depression, but a recovery later in the year with the organization of four more associations in May and June. There are now 25 dairy-improvement associations covering 465 herds and 8,720 cows.

Botany

The extension work in botany during the past year has included the sending of about 2,000 inoculation cultures, involving the writing of 250 letters, and other correspondence including about 200 letters on weed and plant identification and about 30 in reply to miscellaneous inquiries.

Dairy Industry

The past year has developed a heavier demand than ever before for extension work by the Department of Dairy Industry. The work of Professor J. D. Brew in making bacteriological analyses of milk samples at shipping plants, and diagnosing troubles in connection with this work, has developed a very large demand for service of this character in all of the dairy sections of the State. Both Professor Brew and Mr. Ayres have engaged in this work and it has well-nigh excluded all other work since early in the spring. Mr. Ayres has also continued his work in connection with the butter plants throughout the State.

Professor Fisk has met a number of urgent requests for help in connection with the manufacture of cheese and ice cream.

Entomology

Cooperation between the Department of Entomology and the Department of Plant Pathology in most of the work relating to insect pests and plant diseases, has been continued with increasingly satisfactory results. In this connection special emphasis has been placed on demonstration work conducted by special field assistants, which was described in the report for 1919-20 and is again referred to in the report of the Department of Plant Pathology on pages 68 and 69.

There was also cooperation with the United States Bureau of Entomology, looking forward to an experimental demonstration of the feasibility of exterminating the warble fly in one of the dairy counties, yet to be designated, and in conducting an insect-pest survey; in both cases with financial assistance from the Bureau.

In 1920 there was a serious outbreak of the Hessian fly, but the damage from this source was minimized because information obtained in an annual examination of wheat fields by the Department of Entomology enabled the department to warn wheat growers to do their sowing after the fly-free date.

In much of the entomological extension work, and particularly in that relating to special field assistants, the College has had hearty and sympathetic cooperation from Professor P. J. Parrott, of the New York Agricultural Experiment Station at Geneva, and Dr. E. P. Felt, State Entomologist.

The services of the specialist in bee keeping were in greater demand than ever before. He spent 162 days in the field working in 33 counties, conducted 53 demonstrations with an attendance of 835, gave 65 lectures with an attendance of 2,651, attended 36 conventions with an attendance of 1,618, and made 66 farm visits. In the course of the year he made

5,170 contacts, and wrote 1 magazine article, 5 circular letters with a circulation of 1,000, and 870 personal letters.

The work of the bee-keeping specialist was done largely through 36 active bee-keepers' associations, several of which did good work for their members in the cooperative purchase of bee supplies. One association, with 30 members, purchased \$2,300 worth of supplies at a saving of \$900; another, with 15 members, saved \$95 on their purchases.

The work of Dr. A. A. Allen and C. R. Leister in the relations of birds and mammals to agriculture has been continued as in former years. It has consisted largely of lectures, exhibits, and correspondence concerning the beneficial and harmful birds and rodents.

Farm Crops

The extension work of the Department of Farm Crops has included that of two divisions—farm crops and vegetable gardening.

Farm crops. Demonstrations of improved methods of growing crops and the use of good varieties and strains of farm seeds were conducted in all but three of the agricultural counties of the State.

The importance of good seed has been demonstrated with potatoes and oats. In a demonstration on seed potatoes of the Green Mountain variety in Suffolk County, the ten highest-yielding strains produced 409 bushels of potatoes to the acre, while the ten lowest-yielding strains yielded 285 bushels to the acre. In Erie County a disease-free stock produced 168 bushels to the acre and showed 1 per cent of disease, while a common stock yielded 99 bushels to the acre and showed 45 per cent of disease. Oat variety demonstrations showed that recommended varieties of Silvermine and Swedish Select types outyielded all other varieties by 25 per cent. In a similar way it has been shown that good varieties of medium dent corn produce 25 per cent more than the common flint varieties.

Demonstrations were also conducted which showed that native northern-grown clover seed is superior to imported seed, and that northern-grown variegated alfalfa has a great advantage over other strains from sources farther south.

Assistance was given to the Grange League Federation Exchange in locating commercial sources of good alfalfa, grain, and grass seeds for the farmers of the State.

There was continued cooperation with the New York State Potato Association in inspecting fields of potatoes grown for certification by the association. This inspection of 1,270 acres resulted in the passing of 766 acres with a total yield of 190,000 bushels.

Extension workers in the farm crops division spent 358 days in the

field, took part in 65 demonstration meetings with an attendance of 1,120, gave 80 demonstrations with an attendance of 2,735, took part in 95 conferences and conventions with an attendance of 2,710, made 772 farm visits, spent 29 days teaching in extension schools and 16 days at exhibits, and wrote 20 articles, 16 circular letters, and 2,791 other letters.

Vegetable gardening. Two distinct lines of extension work in vegetable gardening were carried on during the year, one dealing with commercial gardening and the other with home gardening, garden clubs, potato clubs, and corn clubs.

In commercial gardening, special emphasis was given to strain and variety demonstrations with cabbage, tomatoes, cauliflower, celery, and onions; plant-growing and -grading demonstrations with tomatoes and cabbage; and fertilizer and cover-crop demonstrations.

Strains of Danish Ballhead cabbage varied in yield from 9 to 18 tons to the acre, the heaviest yielder and the best strain being from New-York-grown seed. Cauliflower strains showed a variation in percentage of marketable heads from 21 to 60 per cent.

The value of grading plants and discarding the poorer ones was demonstrated in four demonstrations in three counties. Tomato plants of the best grade increased the returns \$95 an acre over second-grade plants. Late cabbage plants of grade 1 produced 3.3 tons greater yield than those of grade 2, and 9.3 tons greater yield than those of grade 3.

At the end of June, 87 demonstrations had been started in 19 counties. These demonstrations cover all important phases of vegetable production.

One man has devoted his entire time to home and school gardening and to crops-club work with boys and girls in cooperation with the Department of Rural Education. Extension work in home gardening has consisted of furnishing information through lectures and personal letters, and in cooperation with the Office of Publication in the formulation of a correspondence course and in furnishing a series of timely articles on gardening for the use of the daily and weekly papers of the State. About 75 of these articles have been sent out during the year, and the total printed circulation has been between two and one-half and three millions.

There are enrolled in the junior crop and garden projects this year 4,596 girls and boys. Last year's enrollment was 4,443. There has been a slight decrease in the garden, corn, and bean enrollments, and an increase of potato workers from 1,218 to 1,661. These project workers have been given instruction in the work of their projects by means of mimeographed letters and suggestions, and as far as possible by lectures and demonstrations. Instruction has been given to groups of teachers and other local

leaders, and outlines for demonstrations and other exercises have been prepared for their use.

The extension workers in vegetable gardening spent 344 days in the field, conducted 17 demonstrations with an attendance of 587, gave 147 lectures with an attendance of 11,293, attended 238 conferences and conventions with an attendance of 1,127, made 527 inspections or farm visits, and wrote 105 articles covering a total of 153 pages of manuscript and having a circulation of 3,000,000, 17 circular letters with a circulation of 1,494, and 1,570 other letters.

Forestry

The extension work in forestry has been continued under the policy of concentrated effort on a few things that seemed most in need of attention. Most of this work has been done by Professor G. H. Collingwood, who has had some assistance from Mr. Guise and other members of the staff. The field activities of this work are indicated by the following summary:

Days in the field	108
Demonstrations	16
Attendance	68
Lectures	15
Attendance	899
Conferences and conventions	64
Attendance	503
Inspections	51
Days at exhibits	6

Assistance to the maple sugar industry has been continued in a broad and systematic way, particularly through the encouragement of cooperative efforts among the producers. While the time is approaching when this type of assistance will no longer be needed, it is thought that at the present time it is important and requires considerable attention. A manuscript for a bulletin on the maple sugar and maple sirup industry has been prepared.

During the winter and early spring of 1921, considerable attention was given to aiding and encouraging land owners in tree-planting work, with the result that the department has been concerned in the planting this spring of 237,000 seedlings and transplants of forest-tree nursery stock.

Another important line of work has been that of assisting woodland owners in the proper management of their forest tracts, especially farm woodlots.

The relations between the Department of Forestry and the farm bureaus in the State are being constantly strengthened, and many new contacts have been made through the regional conferences with county agricultural agents.

Those living in the wooded parts of the State are rapidly coming to a realization of the fact that the forest resources of the State are being rapidly depleted and that it pays to give intelligent attention to the care of woodlands. It is highly important that this state of mind be capitalized and made effective through action leading to better forest management as well as forest planting. In the accomplishment of this aim, a well-supported and vigorously promoted forestry extension policy by this institution will render invaluable aid.

Home Economics

The main projects in extension work in home economics during the past year have been directed toward (1) improving and maintaining the health of children and adults through establishing good food habits, personal hygiene, and sanitary home conditions; (2) assisting home makers in selecting and making clothing; and (3) laying the foundation for future work in child training.

The college specialists have helped the county and city home bureaus plan their programs of work, and have also given lectures and demonstrations, conducted five-days extension schools, helped in organizing nutrition-health classes for children, and trained local leaders for passing on instruction.

Probably the most constructive part of the year's work in nutrition was done in connection with the seven nutrition-health classes which the specialist assisted in organizing and in which 244 children were enrolled.

The serving of hot school lunches has been encouraged, and in almost every county the number of schools serving them has increased. The nutrition specialist worked in 22 counties and reached 3,178 persons, through 44 lectures with a total attendance of 2,089 and 9 extension schools with a total attendance of 1,089.

The foods project has emphasized a liberal use of milk and the preservation of food. Two cars for exhibits and demonstrations were run over the New York Central lines during May and June in cooperation with the New York Central Railroad and the Child Health Organization of America. Demonstrations on the use of milk were given every afternoon, and school children were taught the rules of health in the mornings. The food specialist gave thirty lectures and demonstrations on these cars, with a total attendance of 2,777. During the year the food specialist

visited 33 counties and gave 50 lectures and demonstrations with a total attendance of 47,086, in addition to conferences on the program of work with home bureaus.

The specialist in diet in the treatment and prevention of disease gave 31 lectures reaching a total of 1,475 persons.

The project to promote health in the home has been under way only half the year. The specialist has given lectures to show the relation of home sanitation to the health conditions of the community, and has worked with members of the home bureau and of women's clubs in formulating minimum standards for sanitation of rural homes, and outlines for scoring homes, to be used by persons who have volunteered to study their own home conditions. During the past half year the specialist has worked in 11 counties and has given 52 lectures with a total attendance of 1,312.

The clothing project has emphasized the economic, hygienic, and aesthetic principles of selection and construction of clothing. The project has been developed through the work of one specialist in conducting 18 five-days extension schools in 12 counties with a total attendance of 2,159 and in giving 15 single lectures and demonstrations in 10 counties with an attendance of 579, and that of two other specialists organizing and developing local-leader training schools, a new method of extension teaching.

In the latter type of work two representatives elected from each interested community met in district training schools, received instruction from the specialist, and then not only gave this subject matter to home makers in their respective communities but also encouraged the establishment of textile-testing departments in the larger stores and better quality and assortment of goods in the small rural and village stores, and the establishment of home economics in local schools. Training schools were held each month for from four to six months in each of the 11 counties cooperating, the number of schools in each county varying from two to five depending on the number of communities cooperating. The attendance at each school varied from 10 to 28. The figures are as follows:

Territory covered	11 counties, 1 city
Training schools held	93
Communities represented	255
Leaders trained	726

In addition to these figures for training schools, the specialist in charge also held 29 meetings for organization purposes with 1,697 in attendance.

A beginning was made this year in extension instruction in attractive home surroundings. Material for a loan exhibit was prepared, ten lectures were given by the specialist with a total attendance of 432, and

assistance was given in several cases in making rest rooms, community houses, and home bureau offices function as demonstration centers of good environmental conditions.

Twenty lectures on child training were given by a resident instructor who visited 8 counties and addressed 3,299 persons. The enthusiastic response given by home makers to this piece of work has indicated a strong desire for its continuance as a well-established extension project.

In all, extension work in home economics has been done in 50 counties during the year, by nine specialists (four on part time) who have given 363 lectures and 525 demonstrations with a total attendance of 58,857, conducted 27 extension schools with a total attendance of 3,336, and held 165 conferences with a total attendance of 2,565.

Home demonstration work. The home bureau organization has grown 22 per cent during the past year. The increase includes the addition of five newly organized counties—Tompkins, Chemung, Herkimer, Lewis, and Madison—and of one new city home bureau in Rochester. This brings the total to thirty counties and three cities, as follows: Allegany, Broome, Cayuga, Chemung, Chenango, Cortland, Delaware, Erie, Herkimer, Jefferson, Lewis, Madison, Monroe, Nassau, Niagara, Oneida, Onondaga, Orleans, Oswego, Otsego, Rensselaer, Saratoga, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Wayne, and Westchester Counties; and Buffalo, Rochester, and Syracuse. On June 1, 1921, these home bureaus had a membership of 22,486 home makers, which is an increase over the membership of last year of 6,000 members.

The organization of home bureaus is under way in two additional counties, and preliminary requests have been received for extending the organization to several other counties.

Although the past fiscal year has been one of financial retrenchment, the home bureaus have received more generous local public support than ever before through appropriations by the county boards of supervisors. Every home bureau in the State has received a county appropriation, the average amount being \$2,857.39. These appropriations total \$94,294, which, added to the returns of \$22,486 from membership dues, gives a grand total of \$116,780 from county support.

The home bureaus have grown stronger in power for service. The farm women have shown capacity for leadership under the stimulus of an organized means of acting together to better the things that concern home and community life. More than a thousand women are serving on the executive and other committees of the state, county, and commu-

nity home bureau organizations, and are functioning to give increasingly better local direction to the extension service in home economics and to do for rural community life the vital things that need to be done to preserve and supplement the fundamental institutions of rural life. Thus the home bureaus have helped to organize wholesome recreation, have helped to reopen closed rural churches, have established playgrounds for children, and rest rooms and women's exchanges for farm women, in towns where they trade, and have taken an active and intelligent part in the movement for better rural schools in New York. The organization of the State Federation of Home Bureaus, with its statewide and district meetings, has promoted acquaintance and mutual helpfulness between the home makers of the various communities.

The home bureau programs throughout the State have shown development during the past year in their more specific aims and methods to improve home and community conditions. The executive committees and agents have cooperated with the College in projects to promote the following as main lines of work: optimum nutrition of children and adults, healthful home and community conditions, selection of good clothing and labor-saving methods of making clothing, the use of labor-saving equipment in homes, a more widespread understanding of civics as it relates to home making, more wholesome recreation in homes and communities, the improvement of rural schools, and the improvement of fairs. An effort has been made to strengthen the home bureau program by the appointment of one person to have the responsibility of correlating the college program with the county program.

Landscape Art

The extension work in landscape art has been continued under the same plans as in the previous year, with the point of view of assisting farmers and rural schools and villages in enhancing the value and attractiveness of their property by better arrangement of details and by the planting of suitable trees, shrubs, and vines in proper relationships. This work was in charge of Professor R. W. Curtis, who spent a small part of his time in the field and was assisted by J. P. Porter, whose work was primarily of an extension character. These two men spent 52 days in the field, conducted 2 demonstrations attended by 47 persons, gave 14 lectures attended by 1,696, attended 14 conferences with 109 persons, made 34 inspections, and spent 12 days with exhibits.

Each demonstration is likely to require considerable special study, a survey, the preparation of sketch plans, and some supervision of the work undertaken by the local individual or group. But once the results

of the work are apparent, it becomes a living demonstration for all who pass that way.

Meteorology

The Department of Meteorology has continued to cooperate with the United States Department of Agriculture and the county agricultural agents in furnishing local weather forecasts to interested farmers during the haying and harvesting season. This year arrangements were made for a considerable number of county agricultural agents to get special forecasts each day and to make these available for farmers who might call the office of the county agent by telephone.

The department continued to supply a speaker occasionally for meetings in various parts of the State.

Plant Breeding

While the Department of Plant Breeding had no formal extension project, the members of its staff spent 88 days in the field in activities that may be classified as extension work. They conducted 22 demonstrations with an attendance of 560, gave 4 lectures to 405 persons, attended 2 conferences with 28 persons, and made 92 inspections.

One hundred and thirty bushels of seed oats were distributed among 19 cooperators, 72 bushels of barley among 22 cooperators, and 8 bushels of wheat among 5 cooperators. A large amount of seed wheat, oats, and barley was sold by cooperators through contacts made by the department.

An agreement was entered into between the College and a prominent seed firm of the State, for the latter to grow and offer to the trade strains of wheat, oats, corn, barley, and timothy under inspection by representatives of the Department of Plant Breeding. Such an agreement is open to any firm that will comply with the conditions specified.

Plant Pathology

The extension work of the Department of Plant Pathology has been increasing steadily year by year, and the demands for this work are increasing more rapidly than are the facilities for doing it. This change is due to the development of the farm bureau organization in the State, and to the better appreciation among farmers of the losses occasioned by plant diseases and of the value of employing control measures.

The Department of Plant Pathology has continued to cooperate with the Department of Entomology in the supervision of the work of eight field assistants conducting plant-disease and insect control work for six months during the growing season in eight counties, working through the

office of the county agricultural agent in each of these counties. Four of these men were placed directly by the College and four are assistant county agents appointed as special field assistants by the College to conduct this work. Each received \$50 a month from the College as salary, the balance of their salary and all expenses connected with the work, including the use and maintenance of a car, being provided by the farm bureau. The projects conducted by these men include a fruit-spray information service, potato spraying and seed-plot work, onion-smut control, and control of vegetable diseases and insect pests, also responding to numerous inquiries by personal visits, telephone, and correspondence. They report to their leaders on the appearance, distribution, and control of diseases and insect pests, and these reports are circularized weekly to all cooperating agents.

Continued emphasis has been put on potato improvement as a subproject. This was emphasized in winter meetings and schools, and during the summer 75 field meetings were held with an attendance of 1,794 persons. More than 1,000 persons carried out the subproject. Requests for work on this subproject for the coming season have come from 34 counties and will require the time of two specialists during two summer months. The department also has charge of the potato inspection work, inspecting more than 1,200 acres of 281 growers in 26 counties. Three inspectors were employed during the summer, their salary and expenses being paid from fees charged for their work. These were based on actual cost and amounted to 67 cents for each inspection acre, or 1.13 cents a bushel of those passing all inspections. This work of the department, in cooperation with the Department of Farm Crops and the county farm bureaus, has resulted in a great increase in the planting of better seed.

An important piece of extension work has been conducted by R. S. Kirby in cooperation with the Suffolk Cooperative Association on the control of root, stalk, and ear rot of Luce's Favorite Seed Corn grown by the association. The control consisted of selection and seed testing. Mr. Kirby tested more than 12,000 ears of corn for the 1921 planting, besides maintaining seed plots on Long Island and up-State, making a survey of the disease, carrying on an investigation of the disease, and instructing the grower in its nature, cause, and control.

In cooperation with the United States Department of Agriculture, a limited plant-disease survey was maintained during the year. Three men were sent by the Federal Department to this State and under our direction made inspection for potato wart in 935 gardens not covered in the survey last year. No potato wart was found in the State. The other survey work

consisted in recording and reporting to the Federal Department such diseases as came to our attention. This work was done under the direction of Dr. M. F. Barrus, who, with Dr. C. Chupp, H. E. Thomas, R. S. Kirby, and members of the resident teaching staff, spent 244 days in the field, conducted 73 demonstrations with an attendance of 1,972, gave 41 lectures to 1,666 persons, attended 90 conferences with 1,256 persons, made 552 inspections, taught in extension schools with a total enrollment of 913, and lectured in farm and home institutes with an attendance of 130.

Pomology

Extension work relating to pruning and to the marketing of fruit has been in great demand throughout the year. Many calls for demonstration work in pruning could not be met owing to the resignation of C. G. Vinson on September 1, after which Professor Rees was alone in the work until Professor Peck was appointed on January 1. An interest in long-time demonstrations of pruning and soil management has become apparent, and such special problems as top-working, bridge-grafting, and pollination have received considerable attention.

Extension work on problems relating to marketing has been carried on primarily in connection with the organization of fruit-packing associations. At the beginning of the packing season the extension specialist cooperated with the Western New York Fruit Growers' Cooperative Packing Association, Inc., in conducting a school for packing-house superintendents. The work consisted of lectures on equipment, operation, management, and standardization, and visits to six packing houses. A representative of the department made a careful study of operation methods and equipment in representative associations during the packing season. Much information was obtained which is being passed on for the improvement of older associations and the benefit of new ones which have not yet operated.

The organization of the Western New York Fruit Growers' Cooperative Packing Association, Inc., was one of the most important forward steps in cooperative packing. Professor Rees assisted materially in an advisory capacity in working out the details for organizing and operating this association. The principal benefits claimed by growers from membership in local cooperative packing associations and the central association are: (1) relief from the bother of packing; (2) reduction in cost of high-quality pack; (3) savings on packages and cold storage; (4) the opening of new markets for New York apples—mainly through chain stores; (5) receipt of a price above the average received by non-members.

The field activities of the extension specialists in pomology may be summarized as follows:

Days in the field	211
Demonstrations	56
Attendance	1,130
Lectures	42
Attendance	2,897
Conferences and conventions	71
Attendance	2,117
Inspections	150
Schools—attendance	582
Days at exhibits	9
Lectures at farm and home institutes—attendance..	3,634

Poultry Husbandry

The extension work in poultry husbandry has been continued without much change in plan. A large amount of culling has improved the flocks for egg production, and there is increased interest in, and demand for, the certification of birds for breeding purposes.

Five members of the Department of Poultry Husbandry have devoted themselves primarily to extension work, and others have taken considerable part in it. Members of the department spent 764 days in the field, conducted 356 demonstrations before 6,633 persons, gave 186 lectures attended by 8,820 persons, attended 14 conferences at which 154 were present, made 730 inspections, taught in extension schools that had a total attendance of 839, spent 110 days with exhibits, and lectured at farmers' institutes before 579 persons.

The long-time breed-improvement program includes six steps: the culling of undesirable birds; the certification of the choicest individuals; the trapnesting of a few of the best certified birds; the mating of the best trapnested birds with high-line Cornell males; the distribution of Cornell pedigreed males; and the distribution of Cornell pedigreed chicks.

During the past year the extension workers of the department selected 2,603 fowls and obtained promises from farmers for the selection of 288,230 fowls. It is estimated that about 90 per cent of the persons promising this selection actually cull their birds.

In the certification work, Cornell bands were placed on 12,763 fowls on 177 farms. In the advanced registry work, 354 birds were entered from 43 farms in 28 counties. The annual distribution of Cornell pedigreed stock included 150 cockerels and 3,500 baby chicks bearing wing-

bands and accompanied by records of their ancestors for several generations.

Advisory relations with the Department of Farms and Markets in the management of eight institution farms have been continued since June, 1918, and now show important comparative results. Starting with 3,306 hens and with an average production of 86.1 eggs to the hen at these farms, the number of hens has been increased to 5,824 and the average number of eggs to 109.6, which is a 27-per-cent increase. This work with institution farms involved an average of four visits to each farm each year.

The poultry-farm-management project in which one specialist has served the poultrymen in five southeastern counties has been continued. This work has been so useful and popular that other sections are demanding like service. Plans are practically completed for changing the basis of sharing expense so that in future the cooperators will pay all of the maintenance and half of the salary of the poultry specialist. Heretofore, during the demonstration stages of the project, the cooperators have not paid any part of the specialist's salary.

Rural Education

In connection with the study of rural schools in New York State under the direction of Professor G. A. Works as chairman of the Committee of 'Twenty-one, the staff of the Department of Rural Education has been called upon to do a large amount of extension work to familiarize rural school patrons with the purposes and progress of the study.

Immediately following Farmers' Week the department, with the assistance of Dr. M. B. Hillegas, conducted a one-week school on rural school supervision, which was attended by 25 district school superintendents.

Junior extension. During the calendar year 1920, junior extension work was continued under the same plan and financial arrangement as in 1919. The usual financial arrangement includes \$600 from the College of Agriculture, a refund of \$600 from the State Education Department, and local funds derived from appropriations and private contributions. County junior extension boards are now regularly organized in 23 counties, of which 12 employ full-time county leaders and 5 employ half-time leaders in cooperation with state schools of agriculture. During the year junior extension work was carried on in 44 counties, that in counties not employing regular county junior extension leaders being conducted by local voluntary leaders. There were 640 of these leaders in the State last year, 569 of whom completed the work. For the most part these local leaders are rural school teachers or vocational teachers of agri-

culture, though a considerable number are recruited from successful farmers and home keepers.

The organization of the Junior Extension Office at the College includes the state leader, two assistant state leaders, two subject-matter specialists in home economics, and one specialist in crop projects. Extension specialists in poultry and animal husbandry give some time to junior extension work.

An official of the State Education Department known as the State Supervisor of Junior Home Project Work represents that institution in the cooperative relationships.

The scope of the junior extension work was changed during the year. It has consisted of projects in gardening; potato, corn, and bean growing; poultry, rabbit, calf, pig, and sheep raising; cow testing and record keeping; foods; and clothing. In some cases handicraft work in making such articles as feed racks, crates, flats, plant boxes, and seed-corn racks, has been introduced in connection with appropriate projects and has provided useful employment in winter months. The total enrollment for the year was 15,064.

For the most part, county junior extension leaders have confined their activities to work with girls and boys, but it is now clearly apparent that many farmers are adopting improved practices as a result of the work done by their own or their neighbors' children. This has been particularly apparent in the introduction of purebred stock, better feeding, potato-seed treatment, potato spraying, and poultry culling.

Rural Engineering

In the extension work in rural engineering during the past year, special emphasis was placed on a joint farm and home bureau project on running water and sewage disposal. This project was carried out by means of a truck equipped with a skeleton portion of a house, and a complete water system and sewage-disposal system, which were erected and demonstrated at each stop. Fifty stops were made in 33 counties of the State and 4,500 people attended the demonstrations. This work was followed up during the winter with community meetings and farm shop schools.

As in the previous year, the department placed particular emphasis on the development of extension schools. Gas-engine schools entirely replaced the tractor schools. It was thought that the principles underlying the operation of the small gas engines were the same as those of the large, complicated, multi-cylinder tractor engines, and the small engines were more easily accessible. The farmers brought in their own engines and worked on them with special zest because of personal interest in them.

An entirely new type of extension school was held last year by the department. This was the farm shop school, in which was taught such work as harness repair, soldering, care and use of edged tools, and saw filing. Only two of these schools were held, but the demand for them next winter is large. As there was no available text on harness repairs, Professor Behrends has prepared manuscript for a bulletin on this subject to be published in the reading-course series.

Members of the department have taken part in or conducted the following extension schools:

Three-days gas-engine schools	24
Average attendance	33
Three-days farm-mechanics schools	4
Average attendance	32
Milking-machine schools in cooperation with the Department of Dairy Industry	3
Average attendance	24
Farm shop schools	2
Average attendance	28
Gas-engine school in cooperation with the Depart- ment of Plant Pathology	1
Attendance	21
Gas-engine school in cooperation with the Depart- ment of Farm Management	1
Attendance	48
Community meetings	27
Attendance	938

Rural Social Organization

On the first of October, C. W. Whitney commenced work as extension instructor in rural social organization, and throughout the year he devoted his attention mainly to rural recreation including community singing and rural dramatics. There has been a lively interest in Mr. Whitney's work and a great demand from the farm and home bureau agents for his services. Mr. Whitney has also held several training schools of one or two days for rural leaders in recreation.

Packages of plays are loaned for examination so that persons may order those desired from the publishers, and this service has proved very popular, there usually being a waiting list for these packages. One or two counties are planning to develop a "Little Country Theater" at their county fairs, using several troupes from different localities in the county.

A considerable demand for advice on community houses and community

organization has taken Professor Sanderson, head of the department, into the field many times in the course of the year.

Two members of the department spent 93 days in the field. They conducted 4 demonstrations with an attendance of 290, gave 95 lectures with an attendance of 18,639, and attended 14 conferences and conventions with an attendance of 174.

Soil Technology

The extension work in soil technology has been conducted by Professors E. L. Worthen and A. F. Gustafson. The field demonstration work has been continued along the same lines as in the preceding year. About 200 lime demonstrations were conducted in the summer of 1920, and many of these have been continued. Approximately 50 new lime demonstrations were established this season. The fertilizer demonstrations consist largely of acid phosphate and lime as compared with lime alone, but in some instances acid phosphate is being compared with a complete fertilizer. A few soil-improvement or soil-utilization projects have been started.

In the main the county agricultural agents have been responsible for conducting the field demonstrations, but the specialists have given considerable time to supervision of the work.

The field work of the soils specialists has taken them from the office 212 days; they have given 77 lectures with an attendance of 2,166, attended 71 conferences and conventions with an attendance of 1,356, made 60 inspections, taught in extension schools with an attendance of 277, and lectured at farmers' institutes with an attendance of 1,965.

The office work has demanded considerable time and attention. In addition to a large correspondence with farmers, special attention has been given to requests for expert advice from county agents and various organizations. The county agents were given frequent advice as to the fertilizer situation, and articles for their county papers have been furnished monthly. Several articles have also been written for the agricultural press, and a leaflet has been published on *Home Mixing and Use of Fertilizers*. Some idea of the volume of office work may be had from the fact that 367 soil samples were examined, 13 circular letters were prepared and mailed to 736 addresses, and 2,628 letters were written.

THE RESEARCH ACTIVITIES

The following is a brief report of the research activities of the various departments during the year. It should be explained that the productive research of the College is greater than the report of published work indicates. The printing funds of the College for the year were so in-

adequate that only three experiment station manuscripts were printed, although at least fifteen more would have been printed if funds had been available.

In reviewing the research activities, special attention should be drawn to the work which J. H. Comstock, Emeritus Professor of Entomology, has been doing since his retirement from active teaching. He works daily among us, setting for all a fine example of untiring devotion to the pursuit of truth. He is putting the ripe results of his life work into a series of books, where they will be permanently available to students. Two of them, *The Wings of Insects* and *Introduction to Entomology*, both already in use by entomologists all over the world, have been published since his retirement, and another larger work is nearing completion. These, added to his many contributions of the earlier years and the memory and devotion of countless numbers of students now at work in every land, will be his enduring monument. An institution having such a man associated with it has an incomparable advantage.

Agricultural Chemistry

In the Department of Agricultural Chemistry the following paper has been published:

F. E. Rice—A new conductivity cell. Journ. indus. and eng. chem. 12:1202. 1920.

The conductivity cell here described is of an entirely different design from those commonly in use. It has the advantage of being easily constructed and is of a type that lends itself readily to cleaning. It is not easily broken and cannot be put out of adjustment. It is designed for work where convenience and ease of handling are of greater importance than the utmost accuracy in determining the electrical conductivity of liquids.

The following papers are ready for publication:

F. E. Rice—The electrical conductivity of milk.

A study of the lipolytic enzymes in milk and a method for their determination and estimation.

A quantitative method for the determination of peroxidase in milk.

The following work is under way:

L. J. Cross—Nature and properties of the pectins.

F. E. Rice—A physical chemical study of milk with high apparent (abnormal) acidity.

The application to food problems of apparatus which has heretofore been used for the most part in theoretical chemical investigations, such as apparatus for hydrogen ion determinations, osmotic pressure, and so forth.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management the following papers are ready for publication:

E. G. Misner—An economic study of dairying on 149 farms in Broome County, New York.

An economic study of dairying on 163 farms in Herkimer County, New York.

- W. I. Myers—An economic study of farm tractors in New York.
 C. V. Noble—The cost of living in small factory towns.
 H. D. Phillips—Horse raising in colonial New England.
 G. P. Scoville—Potato production and prices.
 G. F. Warren—Cost accounts for six years on New York farms.

The following work is under way:

- Van B. Hart, W. I. Myers, R. L. Gillett, C. V. Noble, and others—Cost accounts on some New York farms.
 P. V. Horn—Some factors influencing the demand for retail cuts.
 R. G. Knapp—Factors involved in the success or failure of cooperative farmers' stores.
 E. G. Misner—Economic studies of dairy farming.
 W. I. Myers—To determine the methods and costs of farm credit as obtained by farmers through various agencies—country stores, implement dealers, fertilizer dealers, banks, and so forth.
 L. J. Norton—The cost of producing crops grown for canning factories in western New York.
 F. A. Pearson—On milk and fat production and other associated characters.
 G. P. Scoville—Farm management surveys.
 Price and production data (potatoes, apples, hay).
 G. F. Warren—Economics and milk production in New York State.
 Prices of farm products.
 G. F. Warren, K. C. Livermore, G. P. Scoville, and others—An agricultural survey, townships of Ithaca, Dryden, Danby, and Lansing (Tompkins County), and Livingston, Jefferson, and other counties.
 E. C. Young—A study of the movement of farm population.

Animal Husbandry

In the Department of Animal Husbandry the following paper has been published:

- M. W. Harper—Raising colts. Cornell Univ. Agr. Exp. Sta. Bul. 403. 1921.

This bulletin reports a study of thirty-four mares and the colts reared from them during the period from 1909 to 1919. The mares were used for the work on the farms of the New York State College of Agriculture and for hauling coal. A record of the different items of cost in growing these colts is given, together with some of the practices that were found best.

The following paper is ready for publication:

- L. A. Maynard and F. M. Fronda—The relative growth-promoting value of the protein of coconut oil meal, and of combinations of it with protein from various other feeding stuffs.

The following work is under way:

- M. W. Harper—Grain for work horses.
 M. W. Harper and George Haines—Maximum hay and minimum grain for the work horse.
 M. W. Harper and M. S. Morton—Silage for raising colts.
 R. B. Hinman—Protein supplements for swine. The place of protein supplements of animal origin in the feeding of swine in New York State.
 Salt mixtures for sheep. An attempt to arrange some mixture of salts which, if kept before sheep at all times, may take the place of drenching for ridding sheep of worms.
 The value of buckwheat middlings for feeding growing shotes on pasture. An attempt to see how nearly buckwheat middlings may be safely substituted for wheat middlings in feeding growing shotes on pasture.

- L. A. Maynard and F. M. Fronda—The combination of feeding stuffs to get protein mixtures of high quality. A study of the relative growth-producing value of the protein of various feeds, singly and in combination, to establish mixtures of high quality.
- L. A. Maynard and L. C. Norris—A substitute for skim milk for the rearing of calves. A study to establish a formula of proved value for a milk substitute, and to determine the general principles, chemical, physical, and physiological, on which the formulation of a substitute must be based.
- L. A. Maynard and G. Toupin—The relation of the vitamine content of the feed to the vitamine content of the milk produced. A study of the relative efficiency of milk produced on vitamine-rich and vitamine-poor rations, the efficiency being measured by growth studies with white rats.
- E. S. Savage, L. A. Maynard, H. P. Beals, and C. H. Merchant—A study of types of corn for silage. The loss of nutrients in the process of silage making. The comparative feeding value of corn silage from types of corn ranging from a type not maturing ears to a type producing practically mature grain in the latitude of southern New York.

Botany

In the Department of Botany the following papers have been published:

- J. M. Brannon—A simple method for growing plants. *Amer. journ. bot.* 8:176-178. 1921.

In this article is described a simple method of growing plants under sterile conditions, which is especially valuable to a person growing higher plants in the dark since by its use they will grow for several months.

- O. F. Curtis—The upward translocation of foods in woody plants. II. Is there normally an upward transfer of storage foods from the roots or trunk to the growing shoots? *Amer. journ. bot.* 7:286-295. 1920.

From a series of ringing experiments, data were obtained indicating that, contrary to commonly accepted ideas, very little of the food that is manufactured in the leaves and stored in the roots, the trunk, and the larger branches moves up from these storage organs to be used by the growing shoots. Evidence was obtained indicating that, after a few leaves have been produced from foods stored in the smaller twigs and branches, further growth of shoots and leaves occurs at the expense, not of the stored foods brought from a distance, but of the food newly manufactured in the leaves already produced.

- L. Knudson—The secretion of invertase by plant roots. *Amer. journ. bot.* 7:371-379. 1920.

Evidence is presented showing that Canada field pea and corn grown in the presence of sucrose under sterile conditions cause an increase in reducing sugar in the culture solution. Since no enzyme could be detected in the solution, it is suggested that the reducing sugars were excreted by the roots.

- L. Knudson and S. Ginsburg—Suggestions with respect to the measurement of osmotic pressure. *Amer. journ. bot.* 8:164-170. 1921.

Data are presented indicating that saps of differing concentrations are obtained when widely differing pressures are used in extracting the sap from frozen tissue, while little difference in concentration of sap was found when sap from tissue frozen in salt and ice was compared with that from tissue frozen in liquid air. Some comparisons are made between the plasmolytic and cryoscopic methods of determining sap concentrations.

- D. Reddick—A fourth *Phytophthora* disease of tomatoes. *Phytopathology* 10:528-534. 1920.

A disease of tomato is described which is known to occur only in the greenhouses at Cornell University and in fields of the immediate vicinity. Stems of plants of all ages are girdled, a blight of foliage may occur, and fruits may be destroyed. A comparison is made with the three other diseases of tomato caused by species of *Phytophthora*. This disease is different and the fungus causing it does not seem to have been described heretofore. The

biology of the fungus leads to the belief that the disease has the potentiality of considerable destructiveness. Plants which are in the most thriving condition are the most readily destroyed; those that are making very poor growth become infected but do not succumb. The fungus grows and produces cankers on cucumbers, a crop often grown in rotation with tomatoes.

- L. W. Sharp—Somatic chromosomes in *Tradescantia*. Amer. journ. bot. 7:341-355. 1920.

This is a detailed study of the behavior of the chromosomes in vegetative cell division, with special reference to chromosome division, chromosome reduction, and the cytological evidence for the postulated units of inheritance.

- F. B. Wann—The fixation of free nitrogen by green plants. Amer. journ. bot. 8:1-29. 1921.

Seven species of green algae have been isolated in pure culture and grown in the presence of nitrate, ammonia, and amino-nitrogen compounds, both in the presence and in the absence of glucose. At least five species, belonging to the genera *Chlorella*, *Stichococcus*, and others, in the presence of glucose fixed considerable quantities of free nitrogen amounting in some cases to over 50 per cent increase in total nitrogen. In one species, in the absence of glucose with nitrates, or in the absence of nitrates with glucose, a loss in total nitrogen occurred.

- K. M. Wiegand—Additional notes on *Amelanchier*. *Rhodora* 22:146-151. 1920.

This is a record of changes in the author's conception of the eastern species of shadbush and June berries since his revision of this group in 1912. One old species is resurrected, one form is raised to specific rank, and two species are described as new. Critical notes and descriptions are given. Two of the species are found in the Cayuga Lake Basin.

Amelanchier Amabilis, a new name. *Rhodora* 23:48. 1921.

A new name is given to a shadbush whose name previously was *intermedia*.

The genus *Echinochloa* in North America. *Rhodora* 23:49-65. 1921.

This is a systematic revision of the farm-yard grasses of North America. Keys, critical notes, and descriptions are given. One species, eight varieties, and two forms are described as new.

- K. M. Wiegand and M. L. Fernald—Studies of some boreal American *Cerastiums* of the section *Orthodon*. *Rhodora* 22:169-179. 1920.

Critical notes and descriptions concerning the boreal mouse-ear chick-weeds with key, nomenclature, soil notes, and distribution. One species, one variety, and one form are described as new.

The following papers are ready for publication:

- J. M. Brannon—Utilization of dextrose and fructose by fungi.
Utilization of dextrose and fructose by higher plants.
H. E. Knowlton—Studies in pollen, with special reference to longevity.
W. C. Muenscher—The relation between transpiration and the absorption and distribution of mineral nutrients.
L. W. Sharp—An introduction to cytology. A textbook of cytology and its interrelation with genetics.
T. W. Turner—Studies as to the mechanism of certain mineral salts in altering the ratio of top growth to root growth in seed plants.
F. B. Wann and W. C. Muenscher—*Myxomycetes* of Cayuga Lake Basin.
K. M. Wiegand—The protection of nectar and pollen in flowers.

The following work is under way:

- J. M. Brannon—The effect of plant extracts on fungi and higher plants.
H. H. Clum—Studies on the rest period in plants.
O. F. Curtis—Effects of various factors, especially nutrients and water supply, on root growth, both absolute growth and growth relative to that of tops.
Tissues concerned in the upward transfer of foods and nutrients in plants and the mechanism and factors affecting this movement.
O. F. Curtis and Miss A. L. Kibbe—Effect of water supply on root growth, both absolute growth and growth relative to tops.
O. F. Curtis and Miss E. I. Fernald—Studies on polarity and inhibition.

- F. Dickson—The effect of some fungi parasitic upon orchid roots on the germination of orchid seeds.
- A. J. Eames—Anatomy and morphology of angiosperm flowers.
- Miss M. J. Fisher—Anatomy of flowers of the Salicaceae.
- J. J. Grimm—Methods of measuring photosynthesis under field conditions, and effect of water supply, accumulation of products, and other factors on the process.
- K. C. Hyde—A gall disease of *Populus*.
- L. Knudson—Organic nutrition of plants. The possibility of the utilization of soil organic matter.
Function of different sugars in plant metabolism.
Germination studies with seed of orchids.
- L. Knudson and Edwin Hopkins (University of Missouri)—Secretion of enzymes by fungi, and influence of carbohydrates on enzyme production.
Influence of certain carbohydrates on secretion of amylase by *Botrytis* sp.
- W. C. Muenscher—The possibility of the utilization of inorganic nitrogen (NO_3 and NH_4) by green plants (algae) in the absence of light.
- L. F. Randolph—A cytological study of the cells of various races of maize, with special reference to the origin and behavior of chloroplasts.
- D. Reddick—The conditions of parasitism.
External conditions affecting resistance or susceptibility. Interrelations, etcera.
Mosaic disease of beans and other legumes: nature, cause, control.
- J. R. Schramm—Investigation of the question, Is there a quantitative relationship between nitrate nitrogen utilized and free nitrogen fixed in algae?
- G. H. Smith—Anatomy of flowers of the Ranales.
- Miss M. E. Stratton—A study of nuclear phenomena in the red algae *Batrachospermum*.
- F. B. Wann—Fixation of free nitrogen by algae.
- F. Weiss—Relation of external conditions to infection and development of the potato wart disease caused by *Chrysophylctis*.
- K. M. Wiegand—Revision of the genus *Oxalis*. A critical study of our eastern species of wood sorrel.
- K. M. Wiegand and A. J. Eames—Flora of the Cayuga Lake Basin. A critical taxonomic, geographic, and soil study of our native plants.
- K. M. Wiegand and M. L. Fernald—Survey of the flora of Newfoundland, with preparation of a flora.
- C. L. Wilson—A study of angiosperm meristem.

Dairy Industry

In the Department of Dairy Industry the following papers are ready for publication:

- W. W. Fisk and W. V. Price—Clarification of milk for cheese making.
- G. C. Supplee, W. A. Whiting, and P. A. Downs—Variations in bacteria counts from milk as affected by media and incubation temperature.

The following work is under way:

- R. W. Bell—The apparent acidity of fresh milk and the detection of small amounts of real acidity.
- H. C. Jackson—Neutralization of cream for butter making.
Setting up and operation of condensed milk pans.
- T. J. McInerney—A comparison of the direct microscopic method and the plate method for counting bacteria in milk.
- H. B. Neville—A study of some of the effects of bacterial action and the heating of milk on the milk proteins.
A study of the proteolytic compounds in milk.
- E. E. Pittman—Bacterial content of creamery waste.
- W. V. Price—A consideration of the effect of the neutralization of the acidity in cream upon the analysis of the resulting butter, upon the acidity of the butter while held in storage, and upon some of the constants of butter.

H. C. Troy—The distribution of moisture in cheddar cheese and changes in its percentage.

Variations in analytical weighings due to differences in temperature.

H. C. Troy and T. J. McInerney—A comparison of the Majonnier method and the Babcock method for determining the percentage of fat in different dairy products.

W. A. Whiting—The bacterial flora of milk utensils with reference to the clumping of bacteria in milk.

Entomology

In the Department of Entomology the following papers have been published:

A. A. Allen—Banding bats. Amer. journ. mammalogy, March, 1921.

This paper describes a method of marking bats for the purpose of identification in a study of habits.

J. C. Bradley—Taxonomy of Masaridae (of the world). Univ. California pubs. 1918.

Nyssonidae. Amer. Ent. Soc. Trans. 46:113-132. 1920.

P. W. Claassen—Are we abusing our water resources? Sci. Amer. 134:—, 1921.

Dairy wastes and fish food. New York State Conservation Commission. Conservationist 3:104-106. 1920.

G. W. Herrick and J. D. Detwiler—Notes on some little-known pests of red clover. Journ. econ. ent. 12:206-209. 1919.

The life history, habits, distribution, and control of the clover head weevil (*Phytonomus meles* Fab.), the lesser clover leaf weevil (*Phytonomus nigrirostris* Fab.), and the clover seed weevil (*Tychius picirostris* Fab.), are discussed. Natural and artificial controls also are dealt with.

S. W. Frost—Two species of *Pegomyia* mining the leaves of dock. Journ. agr. res. 16:229-243. 1919.

This is a detailed account of the life history, habits, and ecological relations of two little-known dipterous leaf miners which live in the leaves of various species of *Rumex*.

L. A. Hausman—The smallest animal in existence. Sci. Amer. monthly, March, 1921.

This paper gives an account of a minute protozoan.

Hair coloration in animals. Sci. Amer. monthly, March, 1921.

This is a popular explanation of the manner in which pigment is distributed in the hairs of various animals.

The vibratile oral membranes of *Glaucoma scintillans*. Amer. nat. 54:427-434. 1920.

This gives a description of a peculiar membrane around the mouth of a protozoan.

G. W. Herrick and C. H. Hadley—A study of habits, activities, and injuries of the clover leaf weevil, with the hope of finding effective methods of control. Ent. Soc. Amer. Ann. 13:101-107. 1920.

O. A. Johannsen—The first instar of *Wohlfahrtia vigil*. Journ. parasitol. 7:154. 1921.

This is a description of the first stage of a parasitic fly causing myiasis in man.

Oxycera tenuicornis or *Euparyphus tenuicornis*? Ent. mo. mag. 57:140. 1921.

This paper deals with a question of the synonymy of an English fly.

C. W. Muesebeck—A revision of the North American species of ichneumon flies belonging to the genus *Apanteles*. U. S. Nat. Mus. Proc. 58:483-576. 1920.

This is a complete revision of the genus *Apanteles*, which is a very important group of insects parasitic on many of our most important insect pests. There is included also a complete statement of the host relationships and life-history data where they are known. The author has included a great amount of biological data gathered from his own observations and rearing work.

W. H. Wellhouse—Hawthorn lace-bug. Journ. econ. ent. 12:441-446. 1919.

This paper gives the life history and a description of a small bug which lives in colonies and sucks the sap from the leaves of several species of *Crataegus*, causing the leaves to turn brown and drop.

Wild hawthorns as hosts of apple, pear, and quince pests. Journ. econ. ent. 13:388-391. 1920.

This is a study of the insects now found on native hawthorns, which appear only occasionally on the apple, the pear, or the quince as yet but may become pests on them later.

The hawthorn blossom weevil. Ent. Soc. Amer. Ann. 14:—. 1921.

This gives an account of the life history and habits of a weevil which breeds in the blossom buds of American hawthorns and destroys many of the buds.

The following papers are ready for publication:

J. L. Buys—The gonapophyses of the Cicadellidae.

P. W. Claassen—*Typha* insects.

J. D. Detwiller—The ventral prothoracic gland of the red-humped apple caterpillar, *Schizura concinna* S. & A.

E. H. Dusham—The painted hickory borer.

M. J. Fisher—The genus *Acroneuria* of stone flies.

Miss L. Florence—The hog louse, *Haematopinus suis* Linné: its biology, anatomy, and histology.

W. T. M. Forbes—The Lepidoptera of New York and the neighboring States.

I. M. Hawley—Insects and other animal pests injurious to field beans in New York.

H. C. Hockett—The ovipositor in the Anthomyiinae.

O. A. Johannsen—The genus *Diamesa* of Meigen.

A seed potato maggot (*Hylemyia trichodactyla*).

Eggs of the potato flea beetle (*Epitrix cucumeris*).

Stratiomyiid larvae and puparia of the northeastern States.

H. H. Knight—Studies on insects affecting the fruit of the apple, with particular reference to the characteristics of the resulting scars.

R. W. Leiby—Polyembryony.

J. S. Latta—The structure of the head in *Acroneuria*.

A. E. Lundie—A biologic study of the parasites of the woolly aphid of the apple, with special reference to their introduction into Southern Africa.

H. G. Mank—A contribution to the knowledge of Staphylinidae.

C. F. W. Muesebeck—Systematic revision of certain groups of parasitic Hymenoptera.

H. E. Murphy—Metamorphosis of the mouth parts of Ephemeridae.

C. Ping—The biology of *Ephydra subopaca* Loew.

R. C. Smith—The biology of the Chrysopidae.

J. R. Traver—Ecology of the may fly *Blasturus cupidus*.

I. H. Vogel—A study of *Ceutorhynchus quadridens*, an important pest on cabbage seeds produced on Long Island.

R. L. Webster—Fumigation of deciduous fruit trees with hydrogen cyanide, with special reference to the pear psylla.

W. H. Wellhouse—The insect fauna of the genus *Crataegus*.

B. P. Young—Attachment of the abdomen to the thorax in Diptera.

The following work is under way:

A. A. Allen—The artificial propagation of the canvasback, the wood duck, the pintail and teal, the bobwhite and California quail, the golden and Amherst pheasants, the ruffed grouse, and other ornamental waterfowl and game birds.

Life histories of birds of eastern North America.

Methods of attracting birds.

The migration of birds.

The banding of birds and bats.

F. O. Bain—Anatomy of the larva of the codling moth.

J. C. Bradley—Revision of Thynnidae of Chile.

Scoliidae of Belgian Congo.

- A. Burroughs—A study of the apple-tree borers and their control with the new insecticide paradichlorobenzene.
- W. H. Brittain—A study of *Psylla mali*, the apple sucker, a recently discovered pest in North America.
- J. L. Buys—The Cicadellidae of New York.
- P. W. Claassen and J. G. Needham—Studies in milk wastes: (1) For the utilization of wastes for the production of fish food; (2) Effect of milk waste on fish and other aquatic life.
- The utilization of *Typha angustifolia* and *T. latifolia* for heat insulation and other commercial products.
- G. C. Embury (in cooperation with the New Jersey Fish and Game Commission)—Breeding disease-resistant brook trout.
- Breeding experiments looking toward the production of a strain of warm-water trout that may be raised in an ordinary farm fish-pond.
- Breeding and cultural experiment with bullhead catfish.
- A. E. Emerson—The classification of South American termites.
- Biology of the termites.
- S. W. Frost—A biological study of the dipterous leaf miners.
- G. H. Griswold—A biologic study of the oyster-shell bark louse.
- R. D. Harwood—A study of the dogwood *Chionaspis*, with special reference to its control.
- L. A. Hausman—*Chlamydodon*, a marine ciliate protozoan.
- Gymnostomine protozoa.
- G. W. Herrick—The life history and habits of the maple leaf cutter.
- The activities and injuries of the cloaked knotty-horn beetle (*Desmocirus palliatus*).
- G. W. Herrick and G. H. Griswold—A detailed study of the distribution, injuries, life history, and habits of the European elm scale, with special reference to its control.
- H. C. Hockett—The control of the cabbage maggot with corrosive sublimate.
- Taxonomy of the Anthomyiidae.
- O. A. Johannsen—Economical production of living food for fish.
- Insect parasites of man and animals.
- Potato insects.
- Problems in the embryology of insects (parthenogenesis, paedogenesis, and so forth).
- C. W. Leister—The natural food of waterfowl.
- The weed beds of upper Cayuga Lake.
- R. Matheson—A study of the parasitism of *Crioceris asparagi* by *Tetrastichus asparagi*.
- A study of the Ixodidae (ticks) of New York State.
- A study of the fleas (Siphonaptera) of New York State.
- R. Matheson and R. C. Shannon—A study of the mosquito fauna of the Cayuga Lake Basin.
- R. Matheson and L. S. West—A catalogue, both host and parasite, of the parasites of insects.
- C. F. W. Muesebeck—The biological control of injurious insect species, with particular reference to insect parasitism.
- J. G. Needham, Hazel E. Branch, and P. W. Claassen—Utilization of bloodworms in the removal of milk waste.
- J. G. Needham and P. W. Claassen—Monograph of North American Plecoptera.
- J. G. Needham, Laura Florence, and A. W. Clark—Conversion of vegetable pulp into fish food through the agency of herbivorous fly larvae (larvae of *Muscina*, and others).
- R. C. Shannon—A biological and systematic study of the Tabanidae, a very important family of blood-sucking flies.
- C. K. Sibley—The caddice worms of lake beds.
- W. H. Wellhouse—Insect enemies of wild plants which are closely related to the cultivated pomaceous fruits.
- Anatomy of the larva of the crane fly *Tipula abdominalis*.
- L. P. Wehrle—A biologic study of the clover seed caterpillar, with a consideration of methods of control.

A study of the life history, habits, and methods of control of certain clover pests, especially the clover seed midge.

L. S. West—A study of the Tachinidae of the Cayuga Lake Basin.

The respiratory system of *Osmoderma socialis*.

C. F. Wu—The biology of the stone-fly genus *Nemora*.

The histology of the nervous system of *Osmoderma socialis*.

Farm Crops

In the Department of Farm Crops the following papers have been published:

H. C. Thompson—Effects of cultivation on soil moisture and on yields of certain vegetables. Amer. Soc. Hort. Sci. Proc. 17: 155-161. 1920.

This is a preliminary report of some experiments comparing cultivation with merely cutting the weeds, as to the effect on the growth of certain truck crops.

P. Work—Effects of nitrate of soda on the nutrition of the tomato. Amer. Soc. Hort. Sci. Proc. 17:138-146. 1920.

This is a preliminary report on some pot experiments to study the effect of nitrogen on the fruitfulness of the tomato. Analyses for nitrogen and carbohydrates were made, and the influence on fruitfulness of the carbohydrate-nitrogen ratio was studied.

The following papers are ready for publication:

E. V. Hardenburg—A study by the crop survey method of factors influencing the yield of potatoes.

R. G. Wiggins—A classification of the cultivated varieties of barley.

The following work is under way:

F. A. Carlson—An investigation of the differences on root habits of species of alfalfa which have different degrees of hardness.

E. V. Hardenburg—A study of field beans as to types and varieties.

A study of potato types as to regional adaptation in New York

A potato variety and type test.

H. S. Mills—A study by the survey method of the factors influencing yields, cost of production, and returns, of canning crops.

H. W. Schneck—Training of greenhouse cucumbers.

Greenhouse tomato variety study.

Strain tests of the Grand Rapids variety of greenhouse lettuce

H. W. Schneck and A. C. Thompson—Pollination of greenhouse tomatoes.

H. C. Thompson—The principles of intertillage. A study of the effects of cultivation on soil moisture, root development, and yields of vegetables.

A study of the causes of premature development of seed stalk of celery.

A study of the effects of pruning and staking tomatoes, on yield, earliness, quality, and cost of growing, also a study of the causes of the effects produced.

H. C. Thompson and F. O. Underwood—A study of the effects of removal of suckers of sweet corn, on earliness, size of ears, total yield, and other conditions.

A study of commercial strains of Bon Best and Chalks Jewel tomatoes, and Copenhagen market cabbage, to locate superior strains for all desirable qualities.

H. C. Thompson and P. Work—Maintenance of fertility for production of vegetable and market-garden crops.

P. Work—Nutrition of the tomato. Studies intended to throw light upon conditions within the plant, correlated with certain external treatments and response of the plants to those treatments. At present confined to nitrogen nutrition.

Systematic study of celery varieties. Classifications and descriptions of existing varieties of celery.

R. G. Wiggins—A study of various rotations on continued production by soils of different types.

A study of silage corn and supplementary silage crops, especially sunflowers and soybeans, including such factors as the stage at which corn is most valuable for silage purposes to the pound of dry matter; the variety which will produce the greatest amount of dry matter to the acre; the effect of planting date on the development and yield of corn; the effect of an irregular stand on the yield of corn; the productivity and adaptations of sunflowers for silage purposes; the varieties of soybeans best suited for silage purposes.

Yield tests of various grass and clover mixtures.

Variety tests of corn, oats, wheat, clover, and alfalfa.

Studies as to the best treatment and the value of pastures.

Floriculture

In the Department of Floriculture the following work is under way:

A. C. Beal—Variety tests of winter-flowering and garden sweet peas.

Variety tests of gladioli.

A. C. Beal and S. C. Hubbard—Rose studies: (1) A study of the hardiness and adaptability of different varieties and types of roses. (2) A study of stocks for roses. (3) A study of the development of an American type of roses. (4) Methods of winter protection, and cultural methods.

A. C. Beal, A. W. W. Sand, and S. C. Hubbard—Peony studies.

Luz A. Minns—Species, types, and varieties of hardy primulas.

A. W. W. Sand—Variety tests of pogon irises.

C. L. Thayer—Variety tests of perennial phlox.

Forestry

In the Department of Forestry the following papers have been published:

J. S. Everitt—Working plan for a communal forest for the town of Ithaca, New York. Cornell Univ. Agr. Exp. Sta. Bul. 404. 1921.

This is the report of a survey of a tract of land near the city of Ithaca, together with recommendations for its management as a communal forest.

A. B. Recknagel—Second-growth hardwoods in the Adirondacks. Journ. forestry 19: 129-130. 1921.

The results of some measurements of the growth on hardwood land cut clear from twenty-five to thirty years ago, are given in this paper.

The following work is under way:

John Bentley, jr.—Volume, growth, and yield studies. Preparation of yield tables for second-growth hardwoods in the Adirondacks.

G. H. Collingwood (assisted by other members of the departmental staff)—The effect of cleanings, thinnings, and improvement cuttings on the volume growth and sugar yield of stands of hard maple.

C. H. Guise—Volume, growth, and yield studies. Sample plots in second-growth stands of mixed hardwoods at Mapleton, New York.

Records of the growth and yield of white pine, scotch pine, red pine, and norway spruce in planted stands, and of evergreens and hardwoods in natural stands, are being kept on sample plots in various sections of the State by members of the departmental staff in cooperation.

Periods required to secure penetration of creosote oil in fence posts of common species of wood when treated by the hot-bath and the cold-bath method.

- A. B. Recknagel—Relative durability of creosoted fence posts treated by (1) brushing, (2) dipping, (3) the open-tank method of creosoting, and set in an experimental line in one of the fences bounding a university woodlot.

The location, supply, and development of the chief pulpwood species in the United States.

- S. N. Spring—Fertilizing in forest nursery practice. Preliminary experiments in fertilizing scotch pine in seedbed plots.

Eradication of weeds from seedbeds and transplant beds, and in forest plantations, by chemical sprays.

Seed production of white pine in Ithaca regions.

Landscape Art

In the Department of Landscape Art the following work is being done:

- R. W. Curtis, A. W. W. Sand, and H. A. Pratt—A study for the purpose of establishing a foliage key to landscape plants.

- E. G. Davis—A study of the history of landscape art.

- J. P. Porter—Landscape architecture: its relation and application to the rural schools of New York.

A study of the ferns of New York in their relation to landscape art.

- Miss M. I. Potter—The history of landscape art in England.

Meteorology

In the Department of Meteorology the following work is under way:

- W. M. Wilson—Studies in evaporation.

- W. M. Wilson and R. A. Mordoff—The relation of the climate of New York to the agricultural industries of the State.

Plant Breeding

In the Department of Plant Breeding the following papers have been published:

- R. A. Emerson—The genetic relations of plant colors in maize. Cornell Univ. Agr. Exp. Sta. Memoir 39. 1921.

Descriptions, illustrations, and discussions of genetic and environmental relations of the six major color types of maize, purple, sun red, dilute purple, dilute sun red, brown, and green (colorless), and of the subtypes, weak purple, weak sun red, green-anthered purple, green-anthered sun red, and five genotypes of green. Sun red and dilute sun red types are shown to be dependent on light for development, while purple, dilute purple, and brown develop characteristic colors in local darkness. Diversities of temperature and soil moisture without direct effect on maize color. Infertile soil intensifies development of purple-red series (anthacyanins) but has no effect on brown (flavonol) pigment. Deficiency of nitrogen, and probably also of phosphorus, responsible for effect of infertile soils. Accumulation of carbohydrates associated with strong color development. Genetic behavior of the several color types interpreted on basis of two allelomorphic pairs and two series of multiple allelomorphs. Two of the four also involved in development of aleurone color. One pair of allelomorphs linked with yellow endosperm and one series of allelomorphs with liguleless leaf.

- William H. Eyster—Heritable characters in maize. VI. Zigzag culm. Journ. hered. 11: 349-357. 1920.

The abnormality known as zigzag culm is described and illustrated, and data bearing on its mode of inheritance are given.

- G. P. McRostie—Inheritance of disease resistance in the common bean. Amer. Soc. Agron. Journ. 13: 15-32. 1920.

Data are presented with respect to the mode of inheritance of resistance and susceptibility of beans to anthracnose, mosaic, and dry root rot. Resist-

ance to anthracnose is a mendelian dominant. One factor pair differentiates between resistance and susceptibility to the *alpha* strain of anthracnose, and one to the *beta* strain, the two pairs being apparently independent of each other in inheritance. Susceptibility to mosaic and to dry root rot are dominant, and the data indicate that at least two complementary factor pairs are concerned in the inheritance of susceptibility to each of the diseases.

The following papers are ready for publication:

- E. G. Anderson—The inheritance of salmon silk color in maize.
The inheritance of pericarp colors in maize.
- Sarkis Boshnakian—The genetics of squareheadedness and of density in wheat, and the relation of these to other characters.
The relation of the spelt factor in wheat to rachis internode length.
- R. A. Emerson—Genetic evidence of aberrant chromosome behavior in maize endosperm.
Heritable characters in maize: crinkly leaf.
- R. A. Emerson and S. H. Emerson—Genetic interrelations of two andromonoecious types of maize, dwarf and anther ear.
- R. A. Emerson and C. B. Hutchison—The relative frequency of crossing-over in microspore and in megaspore development in maize.
- L. A. Eyster—Heritable characters in maize: male sterile.
- W. H. Eyster—The linkage relations between the factors for tunicate ear and starchy-sugary endosperm in maize.
- C. B. Hutchison—Heritable characters in maize: shrunken endosperm.
Heritable variations in maize.
- C. H. Myers, H. H. Love, and F. P. Bussell—Production of new strains of corn for New York.

The following work is under way:

- F. P. Bussell—Breeding barley.
- F. P. Bussell, R. A. Emerson, C. B. Hutchison, and C. H. Myers—Breeding corn for grain and silage.
- R. A. Emerson—Genetic studies in corn, with special reference to linkage.
Breeding field and garden beans for disease resistance. (In cooperation with the Department of Plant Pathology.)
- A. C. Fraser—Mendelian studies with *Aquilegia* and corn.
Breeding hardy roses. (In cooperation with the Department of Floriculture.)
- C. B. Hutchison—Genetic studies of corn and flax.
- H. H. Love—Mendelian studies with wheat and oats.
Selection within pure lines of oats and beans.
Variations in the common daisy.
Breeding wheat, oats, and rye. (In cooperation with the Cereal Office of the U. S. Department of Agriculture.)
- C. H. Myers—Breeding timothy.
Tuber-selection studies with potatoes.
Breeding cabbage.
Inheritance of variations induced by difference in nutrition of wheat.

Plant Pathology

In the Department of Plant Pathology the following papers have been published:

- F. M. Blodgett and K. Fernow—Testing seed potatoes for mosaic and leaf-roll. *Phytopathology* 11:58-59. 1921.
- W. H. Burkholder—The bacterial blight of the bean: a systemic disease. *Phytopathology* 11:61-69. 1921.
- It is pointed out that the bacteria traveling in the xylem vessels may reach all parts of the host plant and produce lesions in any part above ground. The relation of this systemic infection to the various symptoms of the disease and to the control measures is discussed.

C. E. Chardon—A list of the Pyrenomycetes of Porto Rico collected by H. H. Whetzel and E. W. Olive. *Mycologia* 12:316-321. 1920.

A list is given of a total of 112 specimens, representing 65 species.

H. M. Fitzpatrick—Monograph of the Coryneliaceae. *Mycologia* 12:206-267. 1920.

A taxonomic contribution to our knowledge of the group of fungi known as the Pyrenomycetes. Practically all of the species treated are parasitic, and one, occurring on white pine, is destructive and of economic importance.

R. S. Kirby and H. E. Thomas—The take-all disease of wheat in New York State. *Science* 51:368-369. 1920.

This paper reports and briefly describes a disease of wheat indistinguishable from the destructive "take-all" disease (caused by *Ophiobolus*) of Europe and Australia. It is the first authentic record of this disease in America.

L. M. Massey—Experimental data on losses due to crown-canker of rose. *Phytopathology* 11:125-134. 1921.

Losses are to be measured by the decrease in yields of blossoms, not by the death of the host. A decrease of about ten blossoms to each plant represents the annual loss when plants are grown in infested soil.

The following papers are ready for publication:

M. F. Barrus—Bean anthracnose.

C. E. Chardon—A contribution to our knowledge of the Pyrenomycetes of Porto Rico.

E. F. Hopkins—The Botrytis blight of tulips.

The following work is under way:

M. F. Barrus—Discovery of the cause, distribution, and control of little-known potato diseases.

F. M. Blodgett and K. H. Fernow—A study of the leaf-roll and mosaic diseases of potatoes, particularly the relation of potato mosaic to mosaic diseases of other plants, the causes of mosaic and leaf-roll diseases of potatoes, the influence of various factors on the symptoms of these diseases, and the control of these diseases by rogueing, isolation of disease-free strains, and other methods.

O. C. Boyd—The control of *Rhizoctonia* of the potato.

The effect of various dusts in comparison with bordeaux spray, on early blight, late blight, and tipburn of potato.

W. H. Burkholder—The bacterial blight of the bean. The effect of environmental factors on the disease, the nature of the causal organism, and the production of disease-resistant stock.

The dry root-rot of the bean: (1) The nature and cause of the disease; (2) The effect of soil environment on the disease.

C. E. Chardon—Pyrenomycetes of Porto Rico.

C. Chupp—Bacterial disease of lima beans: life history and possible means of control.

G. L. Clapp—The determination of the cause of resistance and susceptibility of different species of pears to blight. The work is directed along morphological and microchemical lines.

F. Dickson—A complete study of *Sclerotinia libertiana* (Fuckel) as a plant parasite.

H. W. Dye—The comparative effectiveness of copper dust and spray for the control of celery blights.

A monographic study of two lettuce diseases—the bottom rot and the stunt.

K. H. Fernow—To determine the cause of the spots in potato fields commonly attributed to lightning. These injuries are sometimes attributed to a *Phoma* which commonly occurs on the dead plants. Work is being conducted on the effect of electric currents on plants, and on inoculations with the fungi found associated with the dead plants.

Transmission of the mosaic diseases. To determine, first, by what means the mosaics and allied diseases may be transmitted, and secondly, to what extent they can be transferred from one host species to another.

- H. W. Fitch—Some phases of dusting in relation to the control of fruit diseases.
- H. M. Fitzpatrick—Morphological and taxonomic studies of *Pyrenomyces*. At present chiefly concerned with the genus *Nitschkia* and its relatives.
- L. O. Gratz—The determination of the cause, effect on host, control, and importance of wire stem on cabbage seedlings occurring at Eden Valley, New York.
- E. E. Honey—Apple flyspecks. A study of the morphology and taxonomy of the causal organisms.

The brown-rot disease of orchard fruits, with special reference to the etiology of the disease.

- R. S. Kirby—*Fusarium* root, ear, and stalk rots of corn in New York State: causal organisms; life history; control.
- L. M. Massey—Corm rots of *gladiolus*. Life history studies; nature of the rots; control. Investigation of the most important diseases (at least three) of this plant.

Diseases of the rose. An investigation of the more important diseases under glass and out of doors. Life history studies; temperature relations; control.

- G. P. McRostie, R. A. Emerson, and W. H. Burkholder—The breeding of varieties of beans resistant to the various diseases of the bean.
- A. G. Newhall—Study of the nature, cause, and control of lettuce tipburn, particularly with reference to the relation of weather, associated organisms, and fertilizers; also varietal resistance.

To determine the nature and seriousness of the onion pink-root disease; control measures, including soil treatment and selection for resistance.

- F. R. Perry—*Fusarium* wilt of potatoes.
- H. E. Thomas—Study of resistance of pears to blight.
- H. E. Thomas and R. S. Kirby—Investigation of take-all of wheat, presumably caused by a species of *Ophiobolus*.
- I. H. Vogel—Cauliflower diseases on Long Island; causes and nature of the diseases, and extent of losses due to them. Diseases of cabbage affecting the seed-growing industry; methods of control.
- H. H. Whetzel—General taxonomic study of forms in the genera *Botrytis* and *Sclerotinia*, especially with respect to the inter-relationships of these forms, host ranges, and biological strains.

Sexuality in the genera *Botrytis* and *Sclerotinia*, and the occurrence of dioecious forms.

Studies on *Botrytis* and *Sclerotinia* diseases of plants. The following partially completed: *Botrytis* diseases of peony; *Botrytis* blight of golden seal; *Sclerotinia* minor stem rot.

Phytophthora bud rot of Bermuda lilies.

- R. P. White—Investigations of pea diseases: (1) *Fusarium* root rot; (2) *Rhizoctonia* collar rot.

Investigation of tomato diseases: (1) Influence of soil moisture on blossom end rot; (2) Nature and cause of the stripe disease.

Pomology

In the Department of Pomology the following papers have been published:

- W. H. Chandler—Some responses of bush fruits to fertilizers. *Amer. Soc. Hort. Sci. Proc.* 17:201-204. 1921.

This is a preliminary report on some experiments with fertilizers for bush fruits. Gooseberries, currants, blackberries, and black and red raspberries were growing on the same soil type and received the same treatments. Marked response to nitrogen was shown by red raspberries, and some by black raspberries and gooseberries, but no perceptible response was shown by blackberries and currants. None of these fruits showed a measurable response to potassium or phosphorus, though maize growing on the same land showed a very marked response to phosphorus.

- A. J. Heinicke—The seed content and the position of the fruit as factors influencing stippen of apples. Amer. Soc. Hort. Sci. Proc. 17:225-232. 1921.

Data and results of observation are presented which indicate that concerning the occurrence of that form of the physiological disease called also *bitter pit*, or *Baldwin spot*, which appears before harvesting the fruit, the following is true: (1) The lateral fruits of a cluster are more frequently affected than the central apples. (2) Fruits on spurs near the end of a twig are less frequently spotted than those nearer the basal part. (3) Apples on weak wood are more subject to bitter pit than those on strong branches; trees invigorated by cultivation or by the application of nitrate have fewer fruits with stippen than trees in sod. (4) Bitter pit occurs most frequently in the smaller, or the few-seeded lateral, apples of a cluster; however, central apples with few seeds often show less pitting than lateral apples with many seeds; the disease is usually found on the side of the apple exposed to the sun, but in case of entirely shaded fruits the spotted side corresponds to the cavity with poor seeds or none at all, while the normal part is found on the side with many plump seeds; the form of bitter pit which develops after harvesting is more frequent on the large, many-seeded side of the fruit. (5) Conditions which seem to inhibit the development of stippen before harvesting are often associated with the occurrence of water core, but the same conditions which favor the development of water core might also favor the occurrence of bitter pit, which manifests itself after the fruit is picked; the form of stippen that appears while the fruit is still on the tree, and the more commonly observed form which appears after harvesting, are both regarded as drought or starvation spots due to the failure to receive water and other nutrients which are needed to continue growth or to mature tissue; it is concluded that seeds and other factors mentioned bear a relation to the development of stippen, probably because they play a part in the phenomenon of incipient wilting and also because they help to determine the distribution of water and nutrients.

The following paper is ready for publication:

- H. A. Phillips—Effect of climatic conditions on fruit trees in relation to the blooming and the ripening dates and the length of the growing period.

The following work is under way:

- D. B. Carrick—Factors involved in the cold storage of fruits.
 Respiration of apples in relation to their keeping quality. A study of the respiratory quotient of apples at common-storage and cold-storage temperatures.
 The influence of hydrogen-ion concentration on the injury of plant tissue exposed to low temperature.
 The freezing point of various apple tissues.
 The hardness of scion and seedling roots of the apple.
- W. H. Chandler—The effect of pruning and of fruiting, especially seed production, on the amount of dry matter produced by a given leaf area, with apples, cherries, grapes, and gooseberries.
 The recovery of fruit trees from serious winter injury.
 Pruning peach trees.
- W. H. Chandler and A. J. Heinicke—The effect of pruning necessary to produce various forms, on the leaf surface, growth, and fruiting habit of apples, pears, plums, quinces, and cherries.
 The relative response of gooseberries, currants, red and black raspberries, blackberries, young apple trees, and corn, when growing in the same soil, to applications of fertilizers.
- R. C. Dikeman—Germination of apple seeds, and the relation of vigor of seedlings to variation in size of apples.
- A. J. Heinicke—Factors that influence size and water supply of apples, and their relation to the occurrence of stippen.
 The effect on fruit trees of possible secretions from grass roots.

The effect of different styles of pruning on the percentage of apple blossoms that set fruit.

Factors that influence the abscission of flowers or young fruits.

The effect of grass on the nitrogen supply of fruit trees, and response of the trees to variations in the nitrogen supply. (In cooperation with the Department of Soil Technology.)

- L. H. MacDaniels—Working out the anatomy and histology of the apple, *Pyrus malus*, with the idea of bringing together a complete account of this one plant which can be used as a reference in considering the structure of this and allied species.

A study of the graft union, from the standpoint both of the histological structure of "incompatible" species and of the alleged difficulty of top-working the Kieffer pear to other varieties of pear.

Further work on the histology of the phloem in certain woody angiosperms.

- E. L. Proebsting—A comparison of the growth of piece root graft from root systems, from weak and from vigorous apple trees.

Poultry Husbandry

In the Department of Poultry Husbandry the following work is under way:

- L. E. Card—A study of the influence of season of hatching on egg production in White Leghorns.
- F. M. Fronda—Temperature studies on poultry.
- G. F. Heuser—Effect of artificial illumination on growth and maturity.
Feeding hens for breeding purposes.
Methods of feeding pullets for egg production.
Methods of feeding pullets for egg production under artificial illumination.
Sources of animal protein.
Studies on digestion of feeds.
- O. B. Kent—Effect of accumulative selection on external characters.
Effect of inbreeding.
Inheritance of egg production in heavy breeds.
Inheritance of egg production in Leghorns.
Relation of external characters to egg production.
- W. G. Krum and F. L. Fairbanks—The amount of light required and the method of distribution in the artificial lighting of henhouses.
- H. I. Macomber and Esther Cornwall—The testing of various methods of preserving eggs, various egg preservatives, and the keeping qualities of different grades of eggs.
- Marion G. Pully—The testing of various methods of egg packages, through uniform shipments and laboratory tests, to ascertain the methods of packing that will cause the least breakage at a minimum cost.
- J. E. Rice and G. F. Heuser—Effect of artificial illumination on breeders.
Electric light and egg production. Influence of artificial illumination on egg production.
Flock segregation.

Rural Education

In the Department of Rural Education the following work is under way:

- O. G. Brim—The effect of local community differences on the rural elementary curriculum.
Relation of the New York State course of study to the rural school situation.
- J. E. Butterworth—Problems concerning rural school buildings: (1) A score card for one-teacher buildings. (2) A score card for combined elementary and

secondary school buildings. (3) The status of rural school buildings in New York. (4) A program of improvement for rural school buildings in New York.

E. N. Ferriss—The availability of secondary education for rural communities.
The distribution of the high school principal's time in the small high school.

The adaptability of the junior high school to rural conditions.

T. H. Eaton and F. W. Lathrop—To discover types of farming and farm enterprises in the Schoharie region, as a guide to content selection in a high school course in agriculture.

P. J. Kruse—The relation of speed and accuracy in mental functions.

The relation of achievements in New York State Regents examinations, and achievements in high school and college.

R. M. Stewart—Inequalities of school support burdens.

Rural Engineering

In the Department of Rural Engineering the following work is under way:

F. L. Fairbanks—A study of the thermal efficiency and the mechanical reliability of the Hvid engine.

F. L. Fairbanks and W. G. Krum—A study of the methods of poultry-house lighting.

F. L. Fairbanks and H. W. Riley—Development of a traction dynamometer for the testing of heavy draft implements, and the perfection of integrating devices for studying the records.

J. C. McCurdy—In subsurface absorption tile receiving the effluent from small domestic septic tanks, a study of the effectiveness of various dosing methods.

In small domestic septic tanks, a study of the relation of tank design to the accumulation of sludge and scum and the discharge of suspended solids in the effluent.

Rural Social Organization

In the Department of Rural Social Organization the following work is under way:

E. L. Kirkpatrick—The farmer's standard of living. To determine, by a survey of three or four hundred typical farm homes in Livingston County, the general standard of living of farmers as related to their income.

D. Sanderson—A study of the rural neighborhoods of Otsego County, to determine the number and location of rural neighborhoods in that county and their social significance.

D. Sanderson, W. S. Thompson, and P. Dunn—Survey of the rural churches in Tompkins County, New York.

D. Sanderson and W. S. Thompson—A study of rural social organization. To discover the existing status in New York of rural community organization, particularly with regard to the behavior of rural communities and the natural process of social organization which has gone on in some of the more progressive rural communities of the State, with a view to making inductions as to the forces and processes of rural community organization.

W. S. Thompson—A study of the social activities of the rural schools in Tompkins County, to determine their influence in the social life of their neighborhoods.

A study of the health problems of rural communities of Cortland County.

Soil Technology

In the Department of Soil Technology the following papers have been published:

- T. L. Lyon—The effect of liming on the composition of the drainage water of soils. *Amer. Soc. Agron. Journ.* **13**:124-130. 1921.

This is a contribution to the symposium on liming soils held at the Springfield meeting of the American Society of Agronomy. The literature bearing on the subject is reviewed, and experiments with lysimeters at this station are briefly reported.

- B. D. Wilson—Nitrogen in the rain water at Ithaca, New York. *Soil sci.* **11**: 101-110. 1921.

With an average yearly rainfall of 29.3 inches between May 1, 1915, and May 1, 1920, the soil received annually 12.51 pounds of nitrogen to the acre. Of this amount, 11.5 pounds was in the form of ammoniacal nitrogen and 1.01 pounds in the form of nitrate nitrogen. The amount of nitrogen in the rain water was to a large extent dependent on the amount of rainfall, a high nitrogen content accompanying a correspondingly high precipitation. The rainfall of the spring and summer months contained more nitrogen than did that of the other two seasons of the year. The quantity of ammoniacal nitrogen brought down in the rain falling at Ithaca is somewhat larger than that reported to be present in many parts of the world, while the nitrate nitrogen is about the same.

- J. K. Wilson—Device for growing large plants in sterile media. *Phytopathology* **10**: 425-429. 1920.

This is a detailed description of a device for growing plants in a sterile medium. Data are presented to show what results may be expected from experiments of 108 days duration with maize and oats. A reference is given to previous work on calcium hypochlorite as a seed sterilizer, and this was used also in securing sterile seeds for this work.

The following papers are ready for publication:

- A. F. Gustafson—The effect of drying soils on the water-soluble constituents.
 T. L. Lyon and J. A. Bizzell—Lysimeter experiments—II. Records for tanks 13 to 16 during the years 1913 to 1917 inclusive.
 T. L. Lyon and J. K. Wilson—Liberation of organic matter by roots of growing plants.
 A. McTaggart—The influence of certain inorganic salts applied to soil on the yield and nitrogen content of some legumes.
 T. L. Martin—Decomposition of green manures at different stages of growth.
 B. D. Wilson—Sulfur in the rain-water at Ithaca, New York.
 J. K. Wilson and B. D. Wilson—Influence of plant growth in solutions on reduction of nitrates, and formation of ammonia by pure culture of certain bacteria.

The following work is under way:

- J. A. Bizzell—To ascertain whether the composition of a soil type as now classified, is fairly uniform and characteristic.
 F. A. Carlson—Some of the relations of organic carbon in soils.
 F. B. Howe—Glacial water levels in Tompkins and Cayuga Counties.
 T. L. Lyon—To ascertain whether the soil type as now distinguished, is an index to the fertilizer needs of a soil.
 T. L. Lyon, J. A. Bizzell, and B. D. Wilson—To measure the nitrogen balance in soil under alfalfa and timothy grown continuously, and under certain crop rotations.

Formation of nitrates in soil during and after the growth of timothy, clover, corn, and oats, as determined by analysis of the leachings.

- T. L. Lyon, J. A. Bizzell, B. D. Wilson, and E. W. Leland—Composition of the drainage water from soils, with special reference to the effects of liming, fertilizing, and cropping.

- T. L. Lyon and H. O. Buckman—The effect of farm manure on the availability of raw rock phosphate.
- T. L. Lyon, A. J. Heinicke, and B. D. Wilson—The effect of sod on the disappearance of nitrates from soil when the trees are injured by sod.
- T. L. Lyon and B. D. Wilson—The effect of different cover crops or green manures when plowed under, on the formation of nitrates in soils.
- J. S. McHargue—Is manganese essential to the normal growth of higher plants?
- Auguste Pepin—Relation of soil basicity to the growth of alfalfa.
- B. D. Wilson—The quantities, forms, and sources of nitrogen and sulfur contained in the rainfall at Ithaca.
- J. K. Wilson—Growth of bacteria in sterilized soil, both planted and unplanted, when inoculated with pure cultures of certain bacteria capable of producing transformations of nitrogen.
- N. E. Winters—Influence of calcium carbonate in soil on the various forms of nitrogen.
- E. L. Worthen and A. F. Gustafson—Tests of certain methods of soil management applied to Ontario loam and Volusia silt loam at Churchville, Alfred, and Virgil.
- Departmental studies—Tests of various mixtures of fertilizer salts on different courses in a crop rotation, as a means of ascertaining soil productivity.
- The effect on soil productivity of continuous cropping when the organic matter of the soil is maintained by means of seeded crops.
- Comparison of the relative efficiency as soil amendments of burnt lime, limestone, marl, gypsum, dolomite, and magnesite, and of limestone ground to different degrees of fineness.

THE FINANCES

A complete detailed account of receipts and expenditures on all funds of the College is given in the annual report of the Comptroller of Cornell University, separately printed. Copies of this report may be had on application. A summary statement of finances is given here.

NEW YORK STATE DEPARTMENT OF AGRICULTURE
Financial Statement, 1920-21

REPORT OF THE DEAN AND DIRECTOR

Fund	Original appropriations	Expenditures previously reported	Amount available or unexpended July 1, 1920	Receipts, Income and Smith-Hughes, 1920-21	Expenditures 1920-21	Balance	
						Lapsed	Unexpended June 30, 1921
State							
1919-20 Maintenance	\$ 939,075.00	\$868,300.61	\$ 70,774.39	.....	\$ 56,202.25	\$14,572.14	.....
1919-20 Game Farm	12,715.00	11,806.88	908.12	.....	705.50	202.62	.....
1919-20 Deficiency	14,000.00	13,742.43	257.57	.....	257.57	.....	.....
1920-21 Maintenance	1,221,930.00	.....	1,221,930.00	.....	1,173,575.01	.....	\$48,354.99
1920-21 Game Farm	14,530.00	.....	14,530.00	.....	12,961.27	.....	1,568.73
1920-21 Deficiency	83,800.00	.....	83,800.00	.....	74,328.74	.....	9,471.26
1920-21 Indian Extension	10,000.00	.....	10,000.00	.....	5,856.12	.....	4,143.88
Total	\$2,296,050.00	\$893,849.92	\$1,402,200.08	.....	\$1,323,886.46	\$14,774.76	\$63,538.86
Federal							
Morrill and Nelson	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch and Adams	27,000.00	.....	27,000.00	.....	27,000.00	.....	.....
Smith-Lever	189,727.52	.....	189,727.52	.....	188,075.12	\$1,650.40	.....
Smith-Hughes	.....	.....	*(4,665.36)	\$25,555.43	27,036.24	.....	*( \$6,146.17)
Total	\$236,727.52	.....	\$232,062.16	\$25,555.43	\$262,111.36	\$1,650.40	*(\$6,146.17)
Income							
Tuition and fees	.....	.....	\$51,615.33	\$114,715.26	\$112,966.96	.....	\$53,363.63
Sales and services	.....	.....	14,416.06	272,281.35	254,346.66	.....	32,350.75
Total	.....	.....	\$66,031.39	\$386,996.61	\$367,313.62	.....	\$85,714.38
Grand total	.....	.....	\$1,700,293.63	\$412,552.04	\$1,953,311.44	\$16,427.16	\$143,107.07

* Overdraft on Smith-Hughes Fund covered by subsequent remittance from State Department of Education.

NEEDS AND RECOMMENDATIONS

1. The most imperative need of the College is that the building development, for which the College has now waited nearly twelve years since the requests were first filed with the Legislature, shall be put forward to completion without interruption. The College is most inadequately housed for the work which is required of it and which it is capable of doing. The service of the existing staff is seriously limited by the lack of proper working conditions.

2. There is most urgent need that larger funds be provided for printing the bulletins needed in the extension service and embodying the results of research carried on by the College.

3. It is recommended that the State reconsider its action withdrawing support for the Experimental Game Farm. The conservation of the wild life of the State should be placed on a scientific basis.

4. While the staff of the College is in the main provided, there is vital need that certain additional members be authorized by the Legislature. Demands are made on the College, in both teaching and extension, which it is impossible to meet with the present staff, and there is urgent need for assistance in a number of lines of investigation. Additional funds are needed from federal or state sources for the completion of the extension system, particularly for additional county home demonstration agents, county junior extension leaders, and extension specialists in distribution and marketing, in dairying, in animal husbandry, in rural social organization, and in home economics.

5. The funds for equipment and supplies have never been sufficient for the needs of the work. Much worn-out and out-of-date equipment, wholly unsuited for teaching the advances made in agriculture, has still to be used; and much of the work of the staff is lowered in efficiency by the necessity of using improper facilities, and by actual inability to purchase apparatus and materials needed for class and laboratory work.

6. The College should be enabled to make a more practical use of the soil survey, on which it has been long engaged. To do so requires (1) that analyses be made of the soil types from different regions in the State to ascertain whether the composition of a given type is fairly constant, wherever found, and that an inventory be made of the potential fertility of the soils of the State; (2) that tests be made of the fertilizer needs of soil types from different regions to determine whether there are characteristic requirements for each type; (3) that tests of systems of soil management be made on a few important soil types by means of outlying experiment fields located on those types. Such studies are fundamental to the permanent maintenance of our most important asset, the

fertility of the soil. The College has the scientific staff for conducting this work, but needs technical assistance, field labor, materials, and funds for the acquisition and operation of the necessary outlying fields. Additional operating funds would extend the accomplishments of the present scientific staff.

7. The Summer School in the College of Agriculture has grown steadily and rapidly. It is designed chiefly to aid teachers, supervisors, and others engaged in the field of rural education. The present small state appropriation is not sufficient to meet the growth in the school and also to pay proper salaries. The salary scale for the Summer School in Agriculture is considerably below that paid in the general university Summer Session, and is also less than that paid by other institutions for similar work. It is therefore becoming increasingly difficult to obtain the services of the necessary teachers to maintain the courses. The appropriation for this work should be largely increased.

In submitting this report, I desire to acknowledge the substantial aid in its preparation given by Dr. W. H. Chandler, Vice Director of Research, Professor D. J. Crosby, Acting Vice Director of Extension, and Dr. Cornelius Betten, Vice Dean of Resident Teaching, as well as of heads of departments and other members of the faculty.

Respectfully submitted,

A. R. MANN,
Dean and Director.

INDEX

A

PAGE

Acting President's letter of transmittal	9
Agricultural Chemistry, extension work in	58
Agricultural Chemistry, research in	76
Agricultural Chemistry, transfer to College of Arts and Sciences	20
Agricultural Economics and Farm Management, extension work in	58
Agricultural Economics and Farm Management, research in	76
Agricultural journalism, courses in	52
Agronomy, new name of department	21
Allen, A. A.	61
Animal Husbandry, extension work in	59
Animal Husbandry, research in	77
Appointments to staff	19
Ayres, W. E.	60

B

Babcock, H. E.	19
Bailey, L. H.	19
Bankers' Association, New York State, scholarships	18
Barrus, M. F.	70
Bee keeping, extension work in	60
Behrends, F. G.	74
Bennett, W. H.	19
Biological field station, land for	25
Biology, work in	34
Botanical collections, additions to	26
Botany, consolidation of instruction in	20
Botany, extension work in	59
Botany, research in	78
Bradley, J. C.	26
Brew, J. D.	60
Brewster, H. C.	19
Brim, O. G.	19
Brockway, A. L.	24
Bruch, Carlos	27
Building program	22
Burnham, Stewart	26
Burker, M. D.	19

C

Carrick, D. B.	19
Changes in internal organization	20
Changes in staff	19
Chemistry, Agricultural, transfer to College of Arts and Sciences	20
Chapp, C.	70
Cullingwood, G. H.	63

INDEX

	PAGE
Commercial cooperative organizations, policy of College with respect to	38
Comstock, J. H.	76
Conservation of forests and wild life, program of	30, 34
Correspondence courses	51
County fair exhibits	49
Curtis, R. W.	67

D

Dairy Industry, extension work in	60
Dairy Industry, research in	80
Dean's report	15

E

Eaton, T. H.	19
Enrollment of students	15
Entomological collections, additions to	26
Entomology, extension work in	60
Entomology, research in	81
Experimental game farm	27
Extension activities of College	45
Extension schools	47
Extension staff	3
Extension workers, summary of field activities	57
Extension work with Indians	49

F

Fair exhibits	48, 49
Farm bureaus	51
Farm Crops, discontinuance of department	21
Farm Crops, extension work in	61
Farm Crops, research in	8
Farmers' Field Days	41
Farmers' organizations, policy of College with respect to	3
Farmers' Week	4
Farm study courses	5
Faz, Alfredo	2
Fellowships, industrial	4
Felt, E. P.	1
Field meetings	4
Financial statement	1
Fippin, E. O.	1
Fish culture	1
Fisk, W. W.	1
Flansburgh, E. A.	1
Floriculture, research in	1
Forbes, W. T. M.	1
Forestry, extension work in	1
Forestry, research in	1
Forestry, work in	1

INDEX

G

	PAGE
Gallion, E. J.	18
Game farm, experimental 27,	35
Geneva station, relations of College with	37
Geographic distribution of students	16
Graves, Lulu	19
Guise, C. H.	63
Gustafson, A. F.	75

H

Heating plans for College	9
Heinicke, A. J.	19
Hillegas, M. B.	72
Home bureau work	66
Home Economics, extension work in	64
Home Economics, School of	39
Hopper, H. A.	59

I

Indians, extension work with	49
Industrial fellowships	43
Instructing staff	3

J

Jenks, J. W.	26
Jordan, W. H.	20
Journalism, agricultural, courses in	52

K

Kirby, R. S.	69, 70
-------------------	--------

L

Ladd, C. E. ....19,	58
Landscape Art, change in organization	20
Landscape Art, extension work in	67
Landscape Art, research in	86
Leister, C. R.	61
Livermore, K. C.	19
Lumsden, David	19
Lyon, T. L.	21

M

Mann, A. R., report	15
Meteorology, extension work in	68
Meteorology, research in	86
Montgomery, E. G.	19

N

Nehrling, A. H.	19
Newman, J. T.	26
New York State Bankers' Association scholarships	18

INDEX

P

	PAGE
Parrott, P. J.	60
Peck, G. W. ....19,	70
Pierson, L. E.	19
Pilcher, L. F. ....14, 23,	24
Plant Breeding, extension work in	68
Plant Breeding, research in	86
Plant Pathology, extension work in	68
Plant Pathology, research in	87
Pomology, extension work in	70
Pomology, research in	89
Porter, J. P.	67
Poultry Husbandry, extension work in	71
Poultry Husbandry, research in	91
President's letter of transmittal. <i>See</i> Acting President's letter of transmittal.	
Publications, distribution of	53
Publications, list of	53
Publications, report on	51
Publications, summary of	55

R

Recommendations	96
Reed, Carlos	27
Rees, R. W. ....19,	70
Registration of students	15
Research activities of College	75
Rice, F. E.	58
Robertson, F. E.	19
Royce, C. H.	59
Rural Education, extension work in	72
Rural Education, research in	91
Rural Engineering, extension work in	73
Rural Engineering, research in	92
Rural Social Organization, extension work in	74
Rural Social Organization, research in	92

S

Sanderson, Dwight	75
Scholarships, New York State Bankers' Association	18
Scholes, Bonnie E.	19
School of Home Economics	33
Small, J. K.	20
Smith, A. W., letter of transmittal	10
Soil Technology, extension work in	70
Soil Technology, renaming of department	2
Soil Technology, research in	9
Staff appointments and changes	1
Staff of instruction and extension	

INDEX

	PAGE
State Fair exhibits	48
Student registration	15
Surveys of country weeklies	52

T

Teaching staff. <i>See</i> Instructing staff.	
Thatcher, R. W.	20
Thomas, H. E. ....19,	70
Thompson, H. C.	21
Treman, R. H.	19
Turner, S. G. H.	18

V

Vegetable Gardening, extension work in	62
Vegetable Gardening, reestablishment of department	21
Veterinary College, association with	21
Vinson, C. G.	70

W

Whitney, C. W.	74
Works, G. A.	72
Worthen, E. L.	75

State of New York

New York State College of Agriculture
at Cornell University
Cornell University Agricultural Experiment Station

Thirty-Fifth Annual Report
of the
Dean and Director
1922

Part II. The Rise and the Significance of
Agricultural Extension

LIVINGSTON FARRAND, President of the University

A. R. MANN,
Dean and Director

W. H. GHANDLER,
Vice Director of Research

CORNELIUS BETTEN,
Vice Dean of Resident Instruction

M. C. BURRITT,
Vice Director of Extension

Transmitted to the Legislature January 15, 1923

THIRTY-FIFTH ANNUAL REPORT

of the

New York State College of Agriculture at Cornell
University and of the Cornell University
Agricultural Experiment Station

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

Albany, January 15, 1923.

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith Part II of the Thirty-fifth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,
Commissioner of Farms and Markets.

FOREWORD

Contrary to custom, the present annual report is issued in two parts, separately printed. The extended, critical review of the origin, development, and present status of extension teaching in agriculture and home economics in the State of New York, written by the Vice Director of Extension, Professor M. C. Burritt, is so valuable a contribution to the literature of this great educational movement that it deserves to stand by itself and to be available for ready reference by the large number of persons engaged in the administration of extension service, and the increasing number who appreciate the high importance of the service. The writer has stated elsewhere: "It is probable that the public little realizes the great extent and diversity of public educational services now being rendered by the forces engaged in agricultural extension teaching. The process of experiment, of change and adaptation, by which they have sought to win the confidence of farmers and render direct aid in the solution of practical farm problems so as to promote a more profitable and permanent agriculture and a more satisfying and efficient country life, constitutes a chapter in the history of America which stands second to no other in the building of an intelligent and competent nation. The full significance of this movement to guarantee security to the Nation in its greatest and most fundamental industry, and to assure an adequate food supply for rapidly mounting populations demanding constantly higher standards of living, has not yet dawned on the public mind. But the forces are working mightily, the Nation is daily reaping the gains, and in time the people generally will more fully understand and appreciate the vast contribution of the nation-wide agricultural extension service."

Part I of this annual report treats of the place of New York as an agricultural State, the State's purpose for its agriculture, some urgent needs of the College, and the operations, changes, and achievements of the year, in the fields of administration and organization, resident instruction, and the agricultural experiment station.

A. R. MANN,
Dean and Director.

CONTENTS

	PAGE
General discussion	83
The significance of extension	84
Extension in agriculture an essential to democracy	85
The place of extension	86
The needs of farmers	86
The history of extension work in New York	88
Farmers' institutes	89
Epoch I — Experiment station extension under the Nixon Act (1894-1906)	90
Local experiments	91
Bulletins	93
Itinerant lectures and schools	93
Instruction in rural schools	94
Correspondence and reading courses	96
Summary and conclusions	97
Epoch II — The growth of the extension idea under the State College of Agriculture (1906-1914)	98
The Experimenters' League	100
Farmers' Week	101
Farm trains	101
Exhibits	102
Extension schools	102
Lectures	103
Publications	103
Local agents	103
The farm bureau	104
Epoch III — Further development of extension work under the Smith-Lever Act (1914-1922)	104
The Smith-Lever Act	105
The farm-bureau movement	106
Organization at the College	108
The program of work	109
Summary of the three epochs in the development of extension work at the New York State College of Agriculture	112
Present status of extension	116
The field organization	116
County agents and farm bureaus	116
Finances	117
Personnel	118
Correlation of county programs	118
Trend of development	119
Home demonstration agents and home bureaus	119
Historical	119
Present status	120
Memberships	121
Organization	121
Financial support	121
County club agents and the junior extension organization	121
Historical	121
Present status	123
Enrollment	123
Subject-matter projects	124
Local or community organization	124
Cooperation with vocational teachers	124
Finances	124
Results	125
Subject-matter departments	125
Personnel	126

Present status of extension (<i>continued</i>):	PAGE
Subject-matter departments (<i>continued</i>):	
General or common activities.....	126
Publications.....	126
Printing.....	127
Other activities.....	127
The news service.....	127
Opportunities for home study.....	127
Cornell Farm Study Courses.....	128
Farmers' Reading Series.....	128
Distribution of bulletins.....	128
List of publications.....	129
Farmers Week.....	132
Farmers Field Days.....	134
State Fair, 1921.....	134
Town and county fairs, 1921.....	135
Extension mail.....	136
Extension Service handbook.....	136
Extension schools.....	136
Programs.....	136
Schools in 1921-22.....	137
Lectures and demonstrations.....	137
Farm and home institutes.....	138
Special departmental activities.....	139
Agricultural Chemistry.....	139
Agricultural Economics and Farm Management.....	139
Agronomy.....	140
Animal Husbandry.....	141
Botany.....	144
Dairy Industry.....	144
Entomology.....	146
Control of injurious insects.....	146
Beekeeping.....	148
Control of birds and mammals.....	148
Forestry.....	148
Home Economics.....	149
Local leadership.....	150
Principal projects.....	151
Nutrition.....	152
Food preservation and preparation.....	152
Clothing.....	153
Home hygiene and sanitation.....	154
Home management.....	154
Child training.....	154
Civics.....	154
Landscape Art.....	155
Meteorology.....	155
Plant Breeding.....	156
Plant Pathology.....	158
Potatoes.....	158
Corn.....	159
Onions.....	159
Miscellaneous.....	159
Pomology.....	160
Pruning.....	160
Cultural methods.....	160
Packing.....	161
Results.....	161
Rural Education.....	161
Rural Engineering.....	162
Drainage.....	162
Gas engines.....	162
Farm shop.....	163

Present status of extension (<i>continued</i>):	PAGE
Subject-matter departments (<i>continued</i>):	
Special departmental activities (<i>continued</i>):	
Rural Engineering (<i>continued</i>):	
Sewing machines.....	163
Water supply and sewage disposal.....	164
Radiophone.....	164
Farm structures.....	164
Rural Social Organization.....	164
Vegetable Gardening.....	165
Demonstrations.....	166
Advanced reading courses.....	166
Home and school gardening and club work.....	167
Summary.....	167
Summary of field activities of Extension Service.....	168
Recommendations.....	171
Summary of thirty years of extension work.....	172

THE RISE AND THE SIGNIFICANCE OF AGRICULTURAL EXTENSION

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Extension work in agriculture is a logical and inevitable outgrowth of the establishment of agricultural colleges and experiment stations: logical, because the extension of knowledge naturally follows its acquisition; inevitable, because the practical demonstration and the useful application of this growing body of agricultural knowledge, which constitute the chief purposes of extension work, were demanded alike by farmers and by experiment station men. The history of the extension movement in New York is a story of mutually helpful contacts between college teachers and farmers. The closer the acquaintance has been, the greater has been the service which college and station have been able to render to farmers, and the more vigorous has been the support of college and station by farmers.

GENERAL DISCUSSION

When in doubt about the best lines of work to pursue, "we therefore went to the farmers with meetings, schools, lectures, and personal inspection of their places; and thereby we found our bearings," as the Director declared in 1899; and at the end of 1901, after eight years of extension work, he was able to report to President Schurman: "It will give you pleasure to learn that the farmers are cooperating with us in a most friendly and intelligent way. There has been such a marked improvement in this respect since we have cooperated with the farmer at his home as to justify me in the belief that our methods of conducting investigations are at least good if not superior. I believe that during the last year we have done more toward the promotion of agricultural knowledge and research than in any other year since the station has been established." The wonderful growth and development of the extension work is due in no small measure to this cooperation and spirit of mutual helpfulness, which has characterized the work from its beginning to the present time. This attitude has become more and more marked, until now the management of the entire enterprise is shared with county organizations of farmers who are also providing one-half or more of the total cost.

The modern extension service in New York is the result of twenty years of slow growth as one aspect of college and station work, the importance of which was fully recognized but which had not fully found its place, and of eight recent years of organized intensive development under the Smith-Lever Act. It has had three great impulses, occurring, curiously enough, regularly in ten-years periods, which have marked the beginning of as many epochs — (1) the Nixon Act of 1894, (2) the Act of 1904

establishing the New York State College of Agriculture at Cornell University, and (3) the federal Smith-Lever Act of 1914. Beginning with scattered and more or less unrelated individual contacts by means of correspondence, miscellaneous lectures, farm visits, and local experiments, extension work has been developed, through reading courses and schools and in cooperation with farm organizations, to systematic instruction in schools and meetings and in organized demonstrations conducted by local agents cooperatively supported by farm and home bureau associations in every agricultural county in the State.

The significance of extension

It is a significant fact that extension work probably would not have been inaugurated in New York when it was, had it not been for persistent requests from certain Chautauqua County grape growers that the College of Agriculture at Cornell University should undertake more extensive experimental work in their vineyards, where E. G. Lodeman, of the Cornell experiment station, had been studying their problems in a small way. These requests the Director was compelled to refuse because of the lack of funds. But the next year this movement on the part of the people for the extension of experiment station work was again taken up with the Legislature. It is worthy of especial note that the movement was "initiated and pushed to a final passage wholly by a farming community."

The establishment of university extension in agriculture in the rural communities of the State marked a new and forward step in public policy. It had long been recognized that public education was an obligation of the State, and provision had been made for such education. It had also been recognized, through the enactment by Congress and the acceptance by the State of the Morrill Act of 1862, that the State had an obligation to teach the principles of agriculture to students who might desire to come to a college of agriculture and study there. In order to apply the benefits of this federal act to this State, New York established the College of Agriculture at Cornell University, which began instruction in 1868. The obligation of the state and federal governments to undertake the discovery of new facts affecting agriculture was recognized in 1887 by the passage of the Hatch Act, establishing federal agricultural experimental stations, and the acceptance of this act in the same year by the Legislature of New York, and by subsequent appropriations by the State for experiment station work at Geneva as well as at Ithaca.

In appropriating funds for farmers' institutes in 1887 and subsequently, the State began to sense its function to teach better farming to adult farmers. By the passage of the Nixon Act in 1894, the public more fully recognized through its government the obligation to carry the teaching of agriculture to farmers on the land and in the localities where they reside. The Nixon Act and the subsequent legislation, which culminated in the federal Smith-Lever Act of 1914, fully established the public policy of giving "instruction and practical demonstrations in agriculture" and marked the beginning of aggressive steps to carry scientific knowledge and general educational assistance to the people in the rural communities.

Extension in agriculture an essential to democracy

As former Director L. H. Bailey has well said, "Democracy rests on the land . . . The farmer is the fundamental fact in democracy . . . not merely because he produces supplies, but because to him is delegated the keepership of the earth, and to him are we to look for the interpretation of the earth in our civic relations." The establishment and maintenance of an extension service in agriculture, reaching out to and cooperating with all the people in the rural communities of the State to conduct constructive programs of education and improvement, would hardly be possible in any country except a democracy; but in a democracy it is one of the essentials for the maintenance and complete functioning of the government.

There are two great interests in agriculture — that of the farmer and that of the general public. To the farmer, agriculture is an essential means of livelihood and of citizenship. He is entitled to a fair opportunity to obtain such livelihood, and to the enjoyment of the necessary facilities of modern life which go to make up a reasonably good standard of living — social, economic, and educational — comparable with the standards of his fellow citizens anywhere.

The general public is interested in agriculture primarily as a source of the food supply. But it is vitally interested also in maintaining upon the land an intelligent, efficient, and satisfied rural citizenship. Only by this means can democracy be maintained; for from the country is drawn in large part the future citizenship of the cities, and upon the standards of living, the ideals, and the right thinking, of the people who live in the country today, depends the status of the Nation tomorrow.

To quote again from former Director Bailey: "The measure of agriculture anywhere is the sufficiency of it as a source of supplies, together with the satisfactions and opportunities for comfortable living and advancement it offers those who engage in it." The public, as represented in national, state, and county legislatures, has an obligation, both to itself and to the farming population, to provide the necessary financial support for the agricultural training of the people who live on the land, through agricultural extension and other means as well as through voluntary means.

In the first report on extension work under the Nixon Act, made in 1896, it is asserted:

One of the distinctive marks of the last decade, in educational lines, is the extension of university teaching to the people. Probably no movement of the latter part of the century is destined to exert a greater influence upon the form of our institutions and civilization, than this attempt to leaven the entire lump of citizenship with the inspiration of higher motives. The agricultural experiment station movement is itself a part of this general desire to carry the new life to every person, whether college-bred or not. But this movement, beneficent as it is, still lacks some of the means of making itself felt. It must have a closer vital connection with the people. The people must be made to hear, even though they desire to be deaf. Good citizenship has a right to demand that every person live up to the full stature of his opportunities.

The place of extension

Extension work has therefore come to occupy a very definite place in the organization of the New York State College of Agriculture. It is one of the three main established lines of work. It is a logical third step in rounding out the agricultural educational program of the College. First came resident teaching. Research in agriculture, which might well have been first, soon followed. No sooner had research been organized and reasonably well established as a necessary means for the discovery of agricultural facts and principles, than it was seen that if the findings of research workers were to be practically utilized by farmers they must be put into form for practical application and tested or demonstrated in various localities. As soon as this was done, it was clear that extension teaching must be organized and conducted in the localities where farmers live.

Education by means of extension work in agriculture is a supplement to the educational system as developed in the public schools. Its field is primarily with adults, with persons just above the school age but not yet come to maturity, and with children outside of the schools. It is to the persons who actually live on the land and are engaged in farming that agricultural information must be carried first. But there is also a place for agricultural education with those persons in the cities and elsewhere who depend directly or indirectly upon the fruits of farmers' labors for their livelihood and prosperity. They must understand the agricultural situation and must be willing to do what is necessary to maintain successfully a profitable and satisfying agriculture.

It has been demonstrated also that agriculture may be used as a means of education. Education has been called the producing of changes in human beings—changes in knowledge, in skill, or in attitude. Such changes have been and may be produced by the study of agriculture; so that not only are persons educated by it, but they are educated in terms of fundamental industry, and in the process they acquire an essential knowledge and understanding of the fundamental character of agriculture.

The needs of farmers

It is true that in the main farmers must solve their own problems. It is essential to their own welfare and growth that they do so. In every community there undoubtedly exists in large measure the ability to solve the individual and the collective problems of that community. To believe otherwise would be to deny faith in democracy and in the ability of people to work out their own problems. The greater the inherent ability in a community, and the more it is applied to the solution of its problems, the better and the stronger are the individuals in the community and also the community itself, and hence the stronger the democracy of which they are a part.

In many communities, however, the ability inherent in strong individuals is not being exercised and applied to its problems. It is dormant. It fails to function. It needs to be stimulated, trained, and set to work. One of the great values of agricultural extension to the farming communities of the State has been the discovery, the attracting, and the training of

farmer leadership in the communities. The persons who have been responsible for extension teaching have nearly always found the rural population ready for instruction, and by far the greater part of those who receive it have endeavored to profit by it. The extension work of the College of Agriculture has in many cases furnished a leaven which, once set to work, has leavened the whole lump of community life.

Extension work in agriculture has been the means of furnishing accurate and more nearly complete information to farmers, on which they may base action looking toward the solution of their individual and collective problems. It has been able to draw this information from the College and the Experiment Station, of which it is a part, and from the best practices and experiences of farmers, which it has collected by survey and observation. "If the farmer thinks correctly, he then does correctly." To furnish the facts is to supply the basis for sound thinking and equally sound action.

Extension work was begun at a time when there was still some derision of so-called "book farming." It has done much to dispel the prejudice against written information about farming, because it has supplied information worth being received. If "book farming" came to be a byword, it was probably because the epithet was deserved. It has been said that farmers are the most difficult of all groups to reach with the educational motive and with information. If this is true, it is rather because of the inherent difficulties of the subjects than because farmers are unwilling to learn. From the beginning the dissemination of information by the agricultural college through extension work has been well and even eagerly received.

The stimulation of thought and action on the part of farmers, through the information given by extension teachers and by personal contact of farmers with these teachers, is not the least of the benefits gained. In his second report on extension work, Professor Bailey pointed out that the greatest need for education was "a general waking up, a shaking out of all the old habits of thought, an injection of new conceptions of life, an intellectual stirring up of every rural community"; and he further pointed out that "we have sought not so much for new facts as for some way of driving home the old facts." This principle of stimulating thought and action on the part of farmers themselves to utilize and apply what they already know, to work out their own problems, has always been a fundamental policy in extension work.

Again, agricultural extension has set up desirable standards of achievement in the rural communities. It has led to the elevation of rural ideals and to the improvement of farm practices. If silos mean a source of cheaper food for livestock, then the progressive farmer looks forward to the building of a silo; if the use of lime means better crops of clover and alfalfa, then one of the standards of measurement of agricultural progress is the use of lime; if household efficiency and comfort mean the installation of a water system, then running water in the home, a bathroom, sewage disposal, and other necessary facilities, become goals for the homemaker. This and much other advancement have resulted from the teaching of agriculture in the communities. In later days we have come to

call these goals or standards of achievement, programs of work, and to organize and try to work them out on the basis of communities and of counties.

Our experience with agricultural extension, brief as it is, has already been sufficient to indicate the true significance of extension work; it is one of the necessary factors in the development of a democracy through the maintenance of a sound agriculture and a satisfied rural population. The modern university-extension impulse is too fundamental and too important not to be adequately maintained and supported as a part of the permanent policy of the State and the Nation. "It is astonishing, as one thinks of it, how scant and poor has been the teaching which has even a remote relation to the tilling of the soil; and many of our rural books seem not to have been born of any real sympathy with the farmer or any just appreciation of his environments. Just as soon as our educational methods are adapted to the farmer's needs, and are born of a love of farm life and are inspired with patriotism, will the rural districts begin to rise in irresistible power." This prediction in Professor Bailey's second report of 1896 is already well on the way toward realization. But much remains to be done.

The history of extension work in New York

The story of how extension work was first established, how it has grown, how its scope has been broadened from dealing with a single aspect to include the whole field of agriculture, how new methods have been developed, and how finally it has come to its present status, is a most interesting and illuminating one. Instruction in agriculture was begun at Cornell University in the fall of 1868. In the years that followed, equipment for teaching and for experimentation was slowly accumulated, the staff and the courses were slightly enlarged, and intimate and sympathetic acquaintanceship with the farmers of the State, chiefly through the officers of the New York State Agricultural Society and the farmers' institute, was gradually built up. Research work, under the Hatch Act, was begun in 1887. Until 1894 practically all the funds and the energy at the disposal of the college and the experiment station staff were expended in the teaching of students who came to the College, in the acquirement and construction of equipment, and in research work. Occasional trips were made about the State to gather information, and these brought members of the college staff into contact with farmers and particularly with farmer leadership. Modern extension work was more or less an outgrowth of these early contacts.

But before we attempt to outline the growth of the extension activities of the College, the work and influence of the farmers' institutes conducted by the State Department of Agriculture for nearly ten years prior to its earliest beginnings should be recorded. These institutes were pioneers and did much to pave the way for modern extension work and the county-agent system. The persons who lectured in these early institutes led the fight for agricultural education and laid the foundation for present activities. Too much credit cannot be given to these men and women and to those others who in the early days went out from the College of Agriculture to carry the message of science and the larger outlook to farmers.

Farmers' institutes

The exact origin of farmers' institutes in New York is not known, but it is pretty well established that they developed from itinerant lectures inaugurated by the New York State Agricultural Society as early as 1842-43. The first meeting in New York that was called a farmers' institute seems to have been a state-wide meeting held in Ithaca on the initiative of Professor I. P. Roberts, of Cornell University, which began on February 16, 1886, and continued for three days. The meeting opened in Morrill Hall, but the attendance was so large — from two to three hundred persons — that later sessions were held in the Cornell Library Building downtown.

From that meeting went a request to the New York State Agricultural Society to hold a limited number of institutes in the State, and at its Utica meeting in September, 1886, the executive board of the society decided to hold at least three institutes and appropriated \$1050 to cover the expenses. The enterprise was put in charge of a committee of four, of which J. S. Woodward, of Lockport, was a member and the secretary. It was under his direction that five institutes, instead of the three anticipated, were held in 1886-87, and it is a matter of record that, from the first, speakers from Cornell and from the Geneva station, as well as successful farmers, took a prominent part in them.

The first state appropriation for institutes — \$6000 — was given to the New York State Agricultural Society in 1887, and twenty institutes were held. This arrangement was continued until 1890, and institutes were held under the direction of J. S. Woodward until the summer of 1889, when J. S. Converse, of Woodville, was appointed Director of Farmers' Institutes. In 1890 the appropriation was raised to \$10,000 and from sixty to seventy institutes were held. That same year, George T. Powell was put in charge of institutes held by the society. In 1892 the appropriation was raised to \$15,000.

In 1893 the New York State Department of Agriculture was established and the management of farmers' institutes was transferred by law to a Director of Farmers' Institutes appointed by the Commissioner of Agriculture. George A. Smith was the first appointee and he held the office for three years.

In 1896 F. E. Dawley, who had been a lecturer in farmers' institutes since 1889, was appointed Director, and in 1898 the appropriation was raised to \$20,000. To Mr. Dawley was due the credit for the establishment of the "normal institutes" (for the training of institute lecturers), the first two of which were held at Cornell University on November 3, 1899, and at Geneva on November 14 and 15, 1899. In 1903 these "normal institutes" became courses of instruction under lecturers from the staff of the College of Agriculture and the Geneva station. They were the forerunners of the annual extension conferences held at the present time.

Under Commissioner Pearson, in 1909, the state appropriation was increased to \$31,000 and the State was districted, with a director of institutes in charge of each of the four districts. In 1911 this was changed again, and Edward VanAlstyne, pioneer institute worker, became director

for the State. He extended institute work to the smaller outlying towns and inaugurated follow-up work. Under his administration the institutes were brought into closer and closer cooperation with the extension work of the College, and following his death in 1917 the State Legislature of 1918 transferred the responsibility for conducting institutes, and the appropriation for carrying on the work, from the State Department of Farms and Markets to the New York State College of Agriculture, as a more proper relationship for a purely educational enterprise. D. P. Witter, a veteran institute worker, came to the College at that time as Adviser in Institute Extension.

EPOCH I—EXPERIMENT STATION EXTENSION UNDER THE NIXON ACT (1894–1906)

The Nixon Act of 1894 marked the beginning of aggressive college extension work in one of the fields of agriculture—horticulture.

Agriculture in New York suffered a severe depression in the last decades of the nineteenth century, especially during the years 1891 to 1893. The movement to the cities was therefore unusually large. This condition alarmed certain persons in the cities, and a conference was called to which a number of upstate farmers and members of the Cornell University faculty were invited. The matter seemed so serious to this conference that a Committee for the Promotion of Agriculture in New York State was appointed, of which Abram S. Hewitt, of New York, was chairman. Director I. P. Roberts and Mrs. J. H. Comstock, representatives of the College, were members of the committee. A Department of Agricultural Education was created, and George T. Powell, a farmer of Ghent, New York, and an institute worker, was made its director.

After studying the matter carefully for some time, the committee concluded to recommend the introduction of nature study into the public schools as a first and permanent step in helping to correct the agricultural situation, and it was decided that the College of Agriculture at Cornell University should conduct the work. In the words of the chairman, Mr. Hewitt, "This should be a movement too large and fundamental for private support and management; it must be a public enterprise financed by the State." The conclusions of the committee were then presented to S. F. Nixon, of Chautauqua County, Chairman of the Ways and Means Committee of the Assembly, who was already interested in the movement in his own county to have experimental work done in the vineyards there. He therefore introduced a bill for the first appropriation in 1894. This appropriation was a grant to the people of the State to be administered by Cornell University. The law was at first an experiment station measure and was specifically directed to a single branch of the rural industry—horticulture—and to a limited section of the State—sixteen counties in western New York.

Thus the initial animus of the entire extension enterprise was "an attempt to inquire into the agricultural status, to discover the causes of the rural depression, and to suggest means for improving the farmer's position." It was recognized that the solution, not only of the immediate problem, but of similar problems for the future, was education. It was

realized also that the depression created the psychological setting for beginning the educational work at once.

In 1896 Professor Bailey, who had been appointed director of the extension work in horticulture, recommended in his report for that year that all extension work should be organized separately from, but intimately connected with, the investigational work of the experiment station, and also that it should be considered as teaching extension rather than experiment-station extension, since this would better carry to the country the university impulse already under way in other fields. In April of the next year it was made possible to put his recommendation into effect through the appropriation of \$25,000, with which the Cornell College of Agriculture (not the Cornell experiment station) was instructed to promote by means of university extension methods all of the agricultural interests of the State. Instead of limiting the activities of the College, as previously, to work in horticulture, this law gave it opportunity to greatly enlarge its field of usefulness to the agriculture of the entire State. With this new law the prosecution of the work passed from the hands of Professor Bailey into the hands of Professor Roberts, the Director of the College of Agriculture.

In 1898, in accordance with the above recommendation and legislation, a clear division was made between the experimental work, which required ample and permanent laboratories and equipment and investigators at the College, and extension work which should be carried on away from the College. Since much of the experimental work then in progress was provided for under the federal Experiment Station Act, most of the work contemplated under the Nixon Act was extension. The funds appropriated were expended about equally for extension teaching and for conducting experiments throughout the State. These experiments were more in the nature of object lessons than of scientific research, for they concerned chiefly problems already well understood and their results were not capable of such exact analysis as those obtained from painstaking and long-continued experiments at the College.

The early efforts to reach the people in extension work were of five general types: (1) the itinerant or local experiment, (2) the readable expository bulletin, (3) the itinerant horticultural school, (4) elementary instruction in the rural schools, and (5) instruction by means of correspondence and reading courses.

Local experiments

From the beginning of extension work, stress was laid on local experiments as a means of teaching better agriculture. These experiments were made "chiefly as object-lessons to farmers and not for the purpose, primarily, of discovering scientific facts." As early as 1898 there were more than five hundred individual cooperators. Professor J. L. Stone was placed in charge of these local crop experiments and gave much of his time to their establishment and supervision. The contacts which he made with farmers, and the knowledge of farm conditions throughout the State which he acquired in this work, were invaluable to the College, and the Director relied much upon his advice and suggestion in the development of all extension activities.

The general plan of conducting the experiments, which were like our present demonstrations, was to send expert field agents to assist in mapping out the work and in selecting suitable ground for experiments on the farms of persons who had applied for them. From time to time the agents inspected the work, gave directions for harvesting, and, so far as possible, assisted in harvesting the crops. After three years of experience in sending out these traveling expert teachers and experimenters, Director Roberts reported that "no other line of effort has been more fruitful in results."

The general idea underlying these experiments was that it was better policy for the College to encourage and assist the farmers to make tests of recommended varieties of the crops they grew on their own soils, than to test these varieties on the station grounds alone. The conclusion of extension teachers was, "What farmers see upon their own or their neighbors' farms has much more influence, we think, than what they read concerning results obtained at the college farm." The printed bulletin was used to convey the information to farmers. The experiment enabled the farmer to see the operation performed and to watch its results. But it was realized that the experiment could not be taken to so great a number as could receive and read bulletins, and that it was relatively more expensive.

There were certain by-products also from this type of work which were thought valuable. Professor J. L. Stone set down three objectives of cooperative experiments: (1) to obtain valuable data; (2) the educational effect of experimental work which "tends to develop the habit of accurate and complete observation"; and (3) to bring farmers and the station into closer relationship of mutual helpfulness, "because it taught the college and station staff more of the farmer's successes and failures and of the problems that are perplexing him."

These "experiments" grew in extent and value. In 1903 they were differentiated into two types—those that demonstrated and illustrated an established truth and principle, and those that attempted to solve new difficulties. The following table indicates the number of farmers and the range of subjects covered by these experiments with field crops in 1904:

Alfalfa (including experiments started in 1902 and 1903, most of which are still running)	16
Oats	3
Fertilizers	1
Potatoes (variety tests).....	6
Sunflowers in corn.....	1
Soy beans	3
Field beans	2
Buckwheat	1
Vetch and rye.....	1
Weed destruction by chemicals.....	1
Liming soils	1
Inoculation of legumes.....	1
Renovation of pastures and meadows.....	1

These comprised a total of 426 experiments undertaken, implying the use of more than 1000 individual plats. The experiments were located in 41 counties of the State.

The experiment work with fruit crops included the fertilizing question, spraying in bloom, orchard renovation, and work with grapes. Some work was done also in entomology and plant pathology, and this increased greatly in later years. In animal husbandry the work was largely confined to the supervision of records of purebred cattle.

These cooperative experimenters were later organized into the Agricultural Experimenters League, and these field experiments were the forerunners of the cooperative field test or demonstration of today.

Bulletins

The preparing and printing, for free distribution, of the results of investigations and experiments and of other information, has always been and still is one of the most important means of extension service. In 1897 Director I. P. Roberts reported that "thousands of publications are sent out by the Station annually, and we have reason to believe that they are read with pleasure and profit. Hundreds of letters are at hand which give evidence that the publications are highly appreciated." By the end of 1896, or after three years of work under the Nixon Act, forty-nine bulletins in all had been published. It was estimated that 60,000 persons had been reached through these bulletins.

These bulletins were reported in 1897 as of five general types:

(1) those which attempt to improve the cultivation of the staple crops; (2) those which endeavor to expound well known principles and facts; (3) those which aim to awaken an interest in flowers and nature and the amenities of rural life; (4) those which suggest new avenues of profit; (5) those which attempt to monograph certain difficulties (as given insects and fungi) with which the horticulturist has to contend. In all of them, it has been the desire to make the matter attractive and readable, so that the entire bulletin would be prized and kept by the recipient.

The editions of these bulletins constantly increased as a result of popular demand for them. While in the early days an edition of 5000 appeared to be ample, in 1903 the Director indicated that "20,000 suffices to fill only the urgent needs."

Itinerant lectures and schools

From the first the importance of "instruction and information" and "disseminating horticultural knowledge by means of lectures or otherwise" was recognized under the Nixon Act. During 1895 and 1896 about fifty meetings were held. That there was good interest and attendance at these meetings held twenty-seven years ago is evidenced by Professor Bailey's account of the "spring rallies" of 1895:

The writer met about twenty fruit growers at Hotel Richmond, Batavia, in early spring. The work of the year in Genesee County was talked over. On the 14th day of May, an orchard meeting was held at South Bethany at which 300 to 400 people were present; on the 18th of July, at a potato-spraying contest at Stafford, 500 or 600 people were in attendance; on the 22d of August, at Nelson Bogue's, near Batavia, the turnout was estimated at 1500 to 2000. Yet, large as this number is, the writer has addressed a western New York farmer's audience of twice this size during the past season! Surely, the time is ripe for sowing the seed of the new agriculture!

Schools of one or two days duration, only, were held as early as 1894. They were the forerunners of the present popular extension school. The

first extension school was held at Fredonia, Chautauqua County, from December 26 to 29, 1894. The enrollment was 58 students. The teachers were W. W. Rowlee, L. H. Bailey, Nelson C. Smith, R. S. Tarr, G. C. Caldwell, I. P. Roberts, and E. G. Lodeman, all of the staff of Cornell University, and S. S. Crissey, G. Schoenfeld, and J. A. Tennant, grape growers in Chautauqua County. Four other schools were held the next year: at Youngstown, Niagara County, August 16 and 17, 1895; at Jamestown, Chautauqua County, October 31 and November 1 and 2, 1895 (enrollment 62 students); at Lockport, Niagara County, November 29 and 30, 1895, and January 1 and 2, 1896 (enrollment 45 students).

By 1897, forty of these horticultural schools had been held in various parts of the State. Six instructors were employed throughout the State in the school and lecture work in 1897, and special teachers were engaged from time to time as occasion required. The bulletins were often used as text for the subjects taught in these schools and lectures. The instruction given was intended to be fundamental in character but of such a nature that it interested the listener in the subject "because of its intellectual relish," and thereby set him thinking. Specimens of twigs, fruits, flowers, and other objects were put into the hands of participants, who were then asked to explain what they saw, thus training the powers of observation.

It was early found that while "these schools are of the greatest practical value in particular places and cases, the larger part of our work can be done more economically than by the holding of schools." The Director therefore concluded that such schools could not be "used as primary factors in university extension," but "they are capable of accomplishing a great amount of good when the community has been awakened by simpler and more elementary means."

For these and other reasons, the two- and three-days schools seem to have lapsed about 1901 and were not resumed for several years. The effort through the itinerant lecturer seems to have been centered on the cooperation with farmers' organizations, especially granges and farmers' clubs, and through participation by members of the college staff in the farmers' institutes.

Instruction in rural schools

Another conclusion arrived at as a result of the early extension work was that the girls and boys on the farms must be reached. This is again and again emphasized in the annual reports covering the work under the Nixon Act. In 1897 it was asserted that "the fundamental difficulty with our agricultural condition is that there is no attempt to instruct the children in matters which will awaken an interest in country life. We have therefore conceived that the place in which to begin to correct the agricultural status is with the children and the rural schools."

Again in 1899 the Director reported: "At last it was perceived that in order to do the greatest good we must reach the children and the young people, and also make use of those who had spent longer or shorter periods of time at the College." Hence, emphasis was laid upon nature study in the schools, upon the farmers' reading courses, and upon junior

naturalists' clubs. A definite policy was then inaugurated, that, while endeavoring to help the farmer in every possible way by all of the means available, "the greatest and most persistent effort should be expended in training the rising generation. The only complete and permanent success is that which takes hold of the very root of the difficulty." Doubtless we are today reaping in our rural district and high schools the results of the training in nature study, and later in courses in agriculture and homemaking, which the present generation received as a result of these early efforts.

As a result of these conclusions the efforts of the available staff were directed mainly (in 1898) toward successfully introducing into the schools of the State "a study of the fundamental principles which govern the soil, the plant and the animal, or the study of agriculture." The chief means used were the leaflets on nature study, of which eight were issued up to 1898 covering such topics as *How a Squash Plant Gets Out of the Seed*, *Four Apple Twigs*, and *A Children's Garden*. These leaflets proved to be so popular that they ran to four, five, and in some cases even six editions. This led to the conclusion that "the work in nature-study has passed the experimental stage; the demand for it is far beyond our facilities for carrying it forward."

But it was perceived also that this instructing of the children of the public schools in nature study could not be done by means of instructors from Cornell University. It was plain that the rural work to be undertaken was to instruct the teachers in the methods of imparting this instruction. A series of nature-study leaflets to show teachers how nature study may be presented to the pupils was then begun. In 1903 nearly two thousand New York teachers were regularly enrolled in the home nature-study course, the larger part of whom were rural school teachers.

This nature-study interest in the schools was further developed by John W. Spencer ("Uncle John"), a practical farmer in Chautauqua County who was brought into the work in 1898. He conceived the idea of organizing the children into "Junior Naturalists' Clubs" for the study of plants and animals and other outdoor subjects. Mrs. Comstock, who shares with him the honor of the development of nature study in the schools, said of him:

His character as "Uncle John" did much to supply the personality that is ordinarily lacking in correspondence work, and an amount of interest and enthusiasm was developed amongst the children which was surprising to those that had not watched its progress. The members of these clubs paid their dues by writing letters about their nature observations to "Uncle John," and a button and a charter were given for continued, earnest work. The work grew to such an extent that for some years 30,000 children were brought into direct connection with Cornell University through this means.

Mr. Spencer soon started a leaflet for the Junior Naturalists, and Miss Alice McCloskey was brought in to assist in this enterprise. This was the beginning of the modern *Rural School Leaflet*. Miss McCloskey contributed a rare pedagogical quality to the nature-study work. She was inspiring, genuine, and full of idealism. The Director esteemed her services as very great.

For the year closing with June of 1904, the Bureau of Nature-Study listed the total work which it had carried on for that year as follows:

Total number of junior naturalists' clubs.....	560
Number of school children members of these clubs.....	15,385
Number of children not organized in clubs, and also teachers who asked for literature written for children.....	1,805
Number of children who expressed an interest in children's gardens and asked for literature on that subject (none of this number were Junior Naturalists)	19,221
Total number of letters received from club members during the school year on subjects relating to rural life.....	33,171
Number of pages mailed to children organized in clubs, and to children interested in gardening.....	960,000

Correspondence and reading courses

In the early reports one sees frequent references to the "heavy correspondence," with clear recognition that this is one of the most important means of extension. It has been variously estimated that from a third to half of the time of individual workers is consumed in answering inquiries and giving personal advice to correspondents.

In 1900 Professor Bailey stated his belief "that a great part of the efficiency of the [Horticultural] Division in the future will lie in the giving of personal advice and the answering of specific questions from correspondents."

In 1902 Director Roberts reported that, owing to the nature of the season and certain other special elements, the letters of inquiry and the demands on the staff had been such as to greatly reduce the number of bulletins that could be issued. This was called "gratifying, as it shows a determination on the part of the farmers to battle with difficulties and a growing appreciation of the help they may secure from the station Neither do I see how we can well avoid answering in the most careful manner the many thousands of requests for information which reach the offices of the various heads of divisions."

The nature-study work and the work with the schools in particular necessitated a heavy correspondence. In 1904 it was reported that "all of the 33,171 children's letters were read by us and inquiries were answered, requiring 7641 letters." This was largely the work of Mrs. Anna B. Comstock and J. W. (Uncle John) Spencer.

The more formal correspondence-instruction by means of reading courses was initiated in 1896, also chiefly as a result of the recommendation of Mr. Spencer. It was somewhat of an outgrowth of the nature-study work in the schools. The first courses were given in the winter of 1896-97, and at the close of the first three months of instruction by means of correspondence there were 1600 young farmers enrolled in the reading courses. These numbers continued to grow, and in 1903 the total enrollment was reported as 26,340. In 1902 the number completing the course was 7675; many others returned a large number of the quizzes, but not all of them in such a condition as to entitle them to certificates.

The first effort to establish the reading course was the recommendation of a set of books and bulletins. This did not work very well and a different plan was soon adopted. The purpose of the courses was two-

fold — “to charge the reader with information concerning his occupation, and to incite him to thought and observation. This we undertake to do by a process of pouring in and pumping out.”

By 1900 the Farmers' Reading-Course was well established and was being more and more systematically organized to give regular instruction to persons enrolled. In 1902 there were 29,792 persons studying in the course. A similar reading course for farmers' wives, on household subjects, was established in 1900, and had an enrollment of 9500 in 1902. The early development of this course was in charge of Martha Van Rensselaer, in whose care “the work greatly prospered.” These enrollments were exclusive of those in the junior naturalists, gardeners', and home nature-study courses, which had 47,800 additional readers in 1902.

In 1904, the “quiz” which usually accompanied the bulletins was replaced by the “discussion paper.” The latter differed from the former chiefly in point of view. The reader was invited and stimulated to correspond with the supervisor concerning the personal application of the lesson to his own farming, and to ask questions on the subject of the lesson or any other farm matters, rather than being examined as was more or less the case in the past.

Summary and conclusions

As a result of several years of work under the Nixon Act with experimental methods in extension, Professor Bailey in 1897 reported his conclusions as follows:

We believe that the most efficient means of elevating the ideals and practice of the rural communities are as follows, in approximately the order of fundamental importance: (1) The establishment of nature-study or object-lesson study, combined with field-walks and in incidental instruction in the principles of farm-practice, in the rural schools; (2) the establishment of correspondence-instruction in connection with reading-courses, binding together the University, the rural schools, and all rural literary or social societies; (3) itinerant or local experiment and investigation, made chiefly as object-lessons to farmers and not for the purpose, primarily, of discovering scientific facts; (4) the publication of reading bulletins which shall inspire a quickened appreciation of rural life, and which may be used as texts in rural societies and in the reading courses, and which shall prepare the way for the reading of the more extended literature in books; (5) the sending out of special agents as lecturers or teachers, or as investigators of special local difficulties, or as itinerant instructors in the normal schools and before the training classes of the teachers' institutes; (6) the itinerant agricultural school, somewhat after the plan of our horticultural schools, which shall be equipped with the very best teachers and which shall be given as rewards to the most intelligent and energetic communities.

Throughout all the reports of the early extension work, emphasis was constantly given to two factors believed to be of great importance. The one was personal work, which was usually thought to give the greatest results whether in correspondence or visits to farms. “Of all the means of reaching the grown-up farmer, the personal visit to his place is the most efficient,” was a conclusion arrived at in 1899. The other point which was frequently emphasized was “that the greatest and most persistent effort should be expended in training the rising generation.”

In reading these early reports of extension activities one cannot fail to be impressed with the large amount of good work done on but slender means,

and with the wonderful response of the people of the State to the agricultural educational opportunities offered. The field was virgin and the need very great. Many of the methods used in these early days have proved to be so efficient that they are still employed. But conditions in agriculture have changed materially, and new methods have necessarily been developed to meet new needs. The coming of good roads and automobiles, and the rise of cooperative marketing, are good illustrations of the necessity of readjusting methods. It is doubtful, however, whether any methods can produce larger results than were obtained in pioneer days.

EPOCH II—THE GROWTH OF THE EXTENSION IDEA UNDER THE STATE COLLEGE OF AGRICULTURE (1906-1914)

The College of Agriculture of Cornell University was made the New York State College of Agriculture at Cornell University by Act of the State Legislature on May 9, 1904, and \$250,000 was appropriated for buildings. On April 12, 1906, \$100,000 was appropriated by the Legislature for its maintenance, and the Administration Act was passed providing for the organization, management, and functioning of the State College. This act authorized the College

to give instruction in the sciences, arts and practices relating thereto, in such courses and in such manner as shall best serve the interests of the state; to conduct extension work in disseminating agricultural knowledge throughout the state by means of experiments and demonstrations on farms and gardens, investigations of the economic and social status of agriculture, lectures, publication of bulletins and reports, and in such other ways as may be deemed advisable in the furtherance of the aforesaid objects; to make researches in the physical, chemical, biological and other problems of agriculture, the application of such investigations to the agriculture of New York, and the publication of the results thereof.

Under this act it was planned to emphasize the teaching of students at the College and the diffusion of agricultural knowledge throughout the State. The Director emphasized the importance of extension work still more than this when he declared in his annual report for 1906: "It [extension work] is capable of accomplishing great good. In fact, it is a question whether it is not the most needful just now of any agricultural teaching. It should be clearly separated from college work, with its own staff of experts trained especially for it."

In 1907 Director Bailey, referring again to the need for the enlargement of extension work, asserted that "a college of agriculture cannot confine its work to the persons who come to its laboratories and class rooms; it must reach every person on the land." To the end that the College might be informed of the needs of the State, surveys were emphasized: "The agricultural condition of every community and of the State should be thoroughly known to the agricultural college; and in order that this condition may be understood it is necessary that agricultural surveys be made. These surveys should have for their object the determining of all the conditions that go to make up failure and success in farming, and to enable the College to draw general conclusions for the betterment of the agricultural condition."

In order to correlate the growing extension activities of the College, many of which concerned more than one department, Charles H. Tuck

was appointed Professor of Extension Teaching in '1907 and placed in charge of the Extension Office. Gradually the general extension activities of the College not belonging to particular departments, such as the reading courses, the Farmers' Week, and the extension schools, were gathered into this office. Its activities embraced also the nature-study work under John W. Spencer as field agent; the home nature-study course under Mrs. Comstock, who was very influential in starting the work in the early days and who was a powerful force in its sound development; and the junior naturalist work under Miss McCloskey. The work of the Extension Office included arrangements for many lectures not specifically arranged by departments. Professor Tuck acted as secretary of the Experimenters' League, and as a conductor of farmers' institutes in one of the districts of the State. The extension teachers were resident in their respective departments, and each department that carried on some extension work reported it separately as one of its three main lines of work.

In 1908, for the first time since the College was made a state institution, educational extension work was definitely differentiated as such by the specific appropriation of \$10,000 "for extension work on farms." In 1911 this specific appropriation was increased to \$50,000 for enlarging the extension work of the College of Agriculture. This made necessary the expansion and development of the central department of extension teaching. It was planned also that every department dealing with agricultural subject-matter should sooner or later organize and conduct extension work in its field. This plan took definite form in 1912, when the Director recommended:

There should also be an Extension Teaching Department in the College, to administer all extension work that is not strictly departmental (that is not a part of the regular departments of the College); and it should aid all departments, so far as it can, in the extension of their special work and make recommendations to them; and it should make recommendations to the Director as to the most advantageous distribution of extension monies in the College. The Extension Teaching Department will have certain functions that are peculiarly its own, such as the administering of itinerant and traveling schools, outside lecture courses, work at the fairs, delegations and excursions coming to the College, reading-courses, correspondence courses, management of resident or local agents, farmers' week and similar enterprises, mailing-room extension, experimenters' league, welfare work in the communities, general publicity and helpfulness of the College of Agriculture to the people of the State.

The emphasis on nature study was somewhat lessened after it had become incorporated in the public-school curriculum and the propaganda for nature study ceased. Attention was centered on instruction to teachers in the principles of agriculture. Most of this nature-study work gradually became centered in the Rural School Leaflet, some issues of which were prepared especially for teachers, and others for the children. Around this nature-study work a Department of Rural Education in the College gradually grew up. The Rural School Leaflet became a part of the work of this department, out of which were later developed also the county junior extension leader, or boys' and girls' club agent, and his work.

During this epoch most of the old lines of work that had been developed in the early years were carried on as usual, but with modifications and

improvements. Extension lectures, publications, and reading courses figured prominently among extension activities. The early extension schools in horticulture, which were dropped about 1900, were resumed in 1910 and largely developed. A few new extension features also were added. These included an organized system of publicity through the press of the State, the establishment of local agents, and the beginnings of farm bureaus.

The Experimenters' League

The Experimenters' League was an outgrowth of the early cooperative experiments of which so many had long been carried on by representatives of the College, particularly with farm crops. It was primarily an organization of the students of the College of Agriculture "for the purpose of fostering the spirit of investigation among farmers." It was organized on March 3, 1903. The constitution states: "The objects of this League shall be, for the promotion of cooperative experiments in the various departments of farm husbandry; for the promotion of intercourse among those studying farm problems; for the advancement of agricultural education; for the collection and dissemination of data relating to country life; and for the purpose of supporting legislation favorable to the promotion of these objects." There were two classes of members, active and associate.

The League did work under five divisions — farm crops, horticulture, animal husbandry, economic botany, and economic entomology. Professor James E. Rice was the first president of the League, and Professor J. L. Stone was the first director of experiments. The director of experiments was actively responsible for carrying forward the experimental work with the cooperators and for correlating the efforts of the members of the League. Personal visits were made during the year by the Director and other members of the college staff to the cooperators throughout the State. Prizes were offered and awarded during Farmers' Week at the College. In 1909 Professor Charles H. Tuck became secretary of the League, and widely advertised and actively promoted the cooperative experiments outlined in the different departments throughout the State.

Beginning with a membership of 60 active graduates and 26 cooperating associates in 1903, the membership of the League grew to about 1000, its maximum, in 1914. In 1909, when Professor Tuck became secretary, there were as many as 500 cooperative experiments. The number of these gradually fell off, however, to 110 in 1913, and to 42 in 1914, when the county agents took them over as "demonstrations." Interest in the conduct of these cooperative experiments seems to have waned somewhat about this time, because the reports frequently indicate attempts "to renew interest." The idea of local experiments was no longer new, and the coming of the county agents and the development of a different type of cooperative demonstration caused the League gradually to cease functioning and to disappear altogether by 1915. This did not occur, however, until the League and the cooperative experiments of the early days, of which it was an outgrowth, had made a very marked and valuable contribution to agricultural knowledge in the State and had helped to

establish both the demonstration idea and a pleasant and useful relationship between the College and the people of the State.

Farmers' Week

One of the new developments of this epoch in extension work was the establishment of Farmers' Week in the winter of 1908. This was the first year in which the new buildings of the College of Agriculture were completely available. It was desired to have the farmers of the State become acquainted with their new State College of Agriculture, to get in closer touch with its teaching staff, and generally to promote cooperative relationships between the College and the people of the State. The first Farmers' Week drew together some 800 persons interested in agriculture. A large number of agricultural organizations were entertained at the College during the week.

The attendance at Farmers' Week in the succeeding years was: 2000 in 1909 and 1910, 2500 in 1911, 2700 in 1912, 3100 in 1913, and 3500 in 1914. With the increased interest and attendance, the program was enlarged and broadened in scope. Gradually Farmers' Week came to be a meeting place for the agricultural, educational, and social organizations of the State, and generally the rallying point of the year for agricultural educational matters. Out of it have developed a most effective contact between the College and the people of the State, and much practical instruction in agriculture and wholesome leadership in agricultural affairs.

Farm trains

Another new development of this period was the operation of farm trains carrying exhibits and lecturers on various phases of agriculture. The first of these "farm specials" was run over the Erie and New York Central Railroads in 1909. Through them an appeal was made to 25,000 persons. In 1910 three farm trains were operated, over the New York Central, the Buffalo, Rochester and Pittsburgh, and the Lehigh Valley Railroad, respectively. This method of teaching has been employed, more or less, nearly every year since 1910. It reached its maximum in 1914, when six "traveling schools" on railroad trains were conducted on four different railroads and reached 20,083 persons. The departments cooperating in teaching on these trains included Plant Breeding, Plant Pathology, Farm Crops, Pomology, Agricultural Chemistry, Animal Husbandry, Dairy Industry, Poultry Husbandry and Soil Technology.

This form of extension work is essentially educational propaganda. In the early years the trains made but short stops at given stations, and about all that could be accomplished was to have the people see the exhibits and hear a brief talk or two on some important phase of farming. Large numbers of persons thus became acquainted with the College of Agriculture and the possibilities of extension work, and were doubtless set to thinking about many farm problems. In later years the idea was modified and special cars were attached to regular trains and made longer stops — usually a half day — so that more definite instruction and demon-

stration could be given. This method has the merits of reaching large numbers of persons in a short time, and enabling the teachers to carry a large amount of exhibit and demonstration material with them. The method is expensive, however, and does not reach certain important groups distant from railroads. While it yet has much possibility for good, especially in certain phases of extension teaching, it has no doubt passed the period of its greatest usefulness.

Exhibits

College exhibits at state and county fairs were made at least as early as 1908, when the Departments of Poultry Husbandry and Plant Breeding conducted exhibits at the State Fair and at several county fairs. In 1909 the College made its first great effort to present a representative exhibit at the State Fair, when twenty-five members of the college staff, representing sixteen departments, set up exhibits and gave advice to hundreds of inquiries. During the same year the College made exhibits at some twenty county and town fairs. Exhibits at the State Fair have been made continuously since 1909, though recently a less number of departments have been represented each year, the departments alternating in different years. Exhibits at county fairs have been continued until very recently. As many as thirty-five or forty fairs have received college exhibits in one year. As the county agents developed better localized exhibits at fairs, the College withdrew from the exhibit field and centralized its efforts in judging competitive exhibits on the demonstration basis; this judging being intended to follow up the suggestions made in a revised premium list for town and county fairs prepared by the College at the request of the State Association of County Agricultural Societies. During the period of greatest interest in fair exhibits, as many as 390,000 persons are estimated to have been reached by the College through exhibits at the fairs. How effectively any of these persons were influenced, there is no means of knowing. The general influence of these exhibits in advertising the College by making known its work to the people of the State, and generally stimulating thought and study of agricultural problems, is probably the greatest contribution made through this means.

Extension schools

The itinerant fruit schools so successfully developed by Professor Bailey during the first few years of extension work under the Nixon Act, and soon abandoned as not the type of extension effort most needed at that time, were reestablished under the leadership of Professor Tuck in 1911. During that year three schools were held in as many counties, with an attendance of 157 persons. In 1912 thirteen schools were held in eleven counties, with 483 persons registered. In 1913 twenty-three counties were reached by twenty-four schools, and 1198 persons attended. The extension schools reached their culmination in the period under discussion in 1914, when sixty-one schools were held in thirty-one counties with 2203 persons in attendance. The extension school is probably the most advanced and intensive method of extension work used by the College. It reaches a less number and is consequently more expensive

per person taught, but a much higher grade of instruction can be given than by most other means, and the results accomplished are therefore doubtless more permanent.

During the summers of 1911, 1912, and 1913, schools for leadership in country life were held at the College of Agriculture. These conferences are worth noting because they represent the first effort of this kind, and because they indicate a recognition of the need for the training of rural leaders. Fundamental courses were offered that would be of value primarily to rural social workers. In 1911, 23 persons attended. This number was increased to 59 persons in 1912, and to 90 persons in 1913, when the school extended over a period of ten days.

Lectures

The first definite figures on the number of persons reached through extension lecturers sent out from the College were given in 1911. They were perhaps not wholly complete, but included 194 lectures given in forty-four counties to 21,560 persons. In 1914 the number of these lectures had increased to 469, given to 48,420 persons. This indicated the status of the extension lecturer as a means of extension prior to the beginning of work under the Smith-Lever Act.

Publications

In 1911 there were 157,254 persons on the mailing lists. In 1914 this number had increased to 285,651. This included the experiment station publications and the reading courses for the farm and home, as well as the rural school leaflets. The circulation of the last-named was the largest of any of the groups, being 217,410. In 1913 there were 22,533 reading-course lessons sent out and 11,156 discussion papers returned, there were 3884 names on the mailing list, and 13 study clubs had been organized. In 1914, the number of publications distributed on request was 77,577.

The large development of the correspondence and material sent out to the people of the State called for the enlargement of the mailing room and the clerical and stenographic facilities. In 1914 twelve persons were employed in the mailing room. A list of 250 local weekly newspapers was gathered and 72 press notices were sent out to these papers during the year. The *College Announcer*, a little publication containing news about the College of Agriculture and its work, was sent to about 800 newspapers in the State.

A tabulation in 1910 indicated that inquiries were received at the College on 1463 different subjects. The first record of correspondence, in 1911, indicated that 13,244 letters were sent out. In 1914 there were 39,715 letters received and 36,244 sent.

Local agents

Apparently the first realization of the need of local connections by means of resident cooperators or agents was in 1911. In that year Director Bailey, in indicating the kinds of extension work that should be carried on, mentioned "the establishing of local agents who shall be

to the agriculture of the community what the teacher is to the education and the minister to the religion." The attempt to put this idea into practical effect was first made in 1912, when Professor Tuck met the representatives of ten counties in conferences at which "local representatives to act as agents for their respective counties" were appointed. The function of these agents was to assist in arranging for various extension enterprises for their respective counties. These county agents were expected to afford a means of bringing the needs of the county to the attention of the College, and of bringing the College into closer relationship with the people. In 1913 seventeen of these so-called "county agents" were listed as representing the College in their several counties. In that year Professor Tuck recommended "that there be a county agent to connect the needs of the people with the services of the College in every rural county of the State," adding, "we have already arranged to aid the people in a serious attempt to secure for themselves a natural way of bringing state aid to their communities through the election of county agents."

The farm bureau

The plan of appointing local persons to act as county agents to assist the College in its extension work was wholly apart from the county-agent-farm-bureau movement which was slowly developing in the State at the same time. At first the College of Agriculture had little part in the organization of this "significant development in country life work," but it freely offered its aid and cooperation on the educational and scientific side. These early farm-bureau agencies were established by the United States Department of Agriculture, in cooperation first with the Lackawanna Railroad and the Chambers of Commerce of Binghamton and Elmira, and later with other railroads, and with the financial aid and support of chambers of commerce and private corporations. Later, state funds were made available through the State Department of Agriculture for the partial support of farm bureaus, and the county boards of supervisors were authorized to appropriate money for this purpose.

It was not until March 1, 1913, that the College of Agriculture joined with the United States Department of Agriculture in the employment of Lloyd S. Tenny as supervisor, or leader, of county agent work, with headquarters at the College. He was a member of the regular staff of the College and part of his function was "to maintain a supervisory relation with former students in respect to their farming operations." In subsequent pages we shall trace the future development of this movement, which was to largely characterize the extension work of the next epoch.

EPOCH III—FURTHER DEVELOPMENT OF EXTENSION WORK UNDER THE SMITH-LEVER ACT (1914-1922)

The opening of the third great epoch of extension work in New York found the movement growing vigorously but beginning to feel handicapped in two important respects. The pressing need for expansion was limited (1) by the money to finance it and to make it available to all the localities, and (2) by the lack of local cooperating agencies and support through

and in cooperation with which to work in the counties. Both of these difficulties and handicaps were realized by those in charge of the work, but how they were to be met was not yet clear. However, some primary steps to meet the needs were already under way.

In spite of the fact that New York with its \$50,000 appropriation for extension work was far ahead of many of the other States, its extension activities had only touched the high spots here and there throughout the State. There were many available matters to be extended by many methods, and but a small fraction of the rural people had as yet been reached. How could this best be done? Would the State undertake to finance it? Should the Federal Government help? Would the localities and the counties make some financial provision for it? Would farmers themselves cooperate in the financial support of extension teaching?

In the preceding epoch we have seen the need for local agencies discovered, and an attempt made to meet the need through the naming of local county agents who were expected to be the local representatives of the College and through whom arrangements for meetings and schools were to be made. We saw also the beginnings of the county-agent movement and the farm-bureau organization, which was to be the outstanding development of the next decade. The county-agent and farm-bureau movement was weak in its beginning because it was not at first a farmers' movement. It was fostered by the Federal Government and by the State Department of Agriculture, and, to a large extent, financed by city interests. How should the movement be organized? Would farmers take part in its management and financial support, and, if so, on what basis? What should be the relation to the farm-bureau organization and the county agent, to the College of Agriculture and its extension work.

The Smith-Lever Act

Some of these questions were well answered when the federal Smith-Lever Act was signed by President Wilson on May 8, 1914. The purposes of this act are "to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same," and to give "instruction and practical demonstrations . . . to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications, and otherwise." In the words of Dr. A. C. True, of the States Relations Service, the Smith-Lever Act provides for "a permanent system of practical education for farming people outside of the schools conducted by public officers for the benefit of all the people. Its aim and purpose is an organized, permanent, public, and truthful extension system."

The act contains a number of new and somewhat remarkable provisions of a democratic character. The work for which it made financial provision is cooperatively planned between the State College of Agriculture and the United States Department of Agriculture. The plans, which have come to be known as "Lever projects," are usually initiated and drawn by the State College of Agriculture and submitted to the federal

Secretary of Agriculture for approval. When approved, they become the joint educational-extension program of work of the Federal Government and the State College of Agriculture.

Liberal financial aid is extended under the act. Beginning with an unconditional appropriation of \$10,000 for each State, the funds were increased over a period of eight years until for 1922-23 they amount to a total of \$4,580,000 for all the States, which sum is to be annually available thereafter. These additional funds are distributed among the States in the proportion that the rural population of each bears to the total rural population of the country. The funds above the original \$10,000 for each State are not available to a State until they have been duplicated or offset by an equal sum actually made available within the State. Practically, this means that New York State will have annually available more than \$150,000 of federal funds and a similar amount of state funds when the act reaches its maximum. As a matter of fact, New York State has more than \$400,000 of state and federal funds available for extension work annually (\$462,070 for 1922-23).

These funds are available for teaching the people in the localities wherein they reside, and the money may not be used for buildings or for teaching at the colleges, and not more than five per cent of it for printing and distributing publications. Thus the question of federal and state aid for the support of county agents and the localizing of college extension teaching, and for extending this teaching to every locality, was in a large measure answered by the Smith-Lever Act, although much yet remained to be done.

The farm-bureau movement

The farm-bureau idea was a supplementary outgrowth of the extension idea. It was a logical and necessary step, the primary purpose of which was the development of local initiative and responsibility. It was felt by those responsible for the early growth and development of the farm-bureau movement, that the agricultural problems of the rural communities could not be worked out by outside agencies alone but must primarily be solved by the people themselves. The outside agencies might supply information, vision, and incentive, but they could not and should not actually do the work. Extension work must be decentralized from the State College of Agriculture, both in support and in management, if it were to become at all adequate to meet the needs. The local people must share in its financial support and in its control and management locally.

The farm-bureau movement was an outgrowth also of the county-agent idea. The county agents had long (since 1904) been at work in the Southern States as well as in the province of Ontario, Canada. New York took the lead in the development of county-agent work in the Northern States. The first county agent was established in Broome County on March 1, 1911. The next year, agents were established in Chemung and Jefferson Counties. Through the interest and the financial aid of railroad companies, chambers of commerce, the grain exchange fund of Chicago, and the United States Department of Agriculture, other agents were rapidly appointed, until on January 1, 1914, there were eighteen county agents at work in the State.

Since this movement had its incentive primarily from urban and outside interests, farmers themselves did not look with special favor on it nor take great interest in it at first. As a consequence the county agents found it somewhat difficult to get the confidence and cooperation of farmers and thus be able to do effective work. This soon brought the leaders of the movement to the conclusion that if the county agent was to effectively serve the people of the State, he must first gain the organized cooperation and support of the farmers themselves. This marked the beginning of the county farm and home bureau association.

Beginning with a nominal membership fee of one dollar and small groups of the most progressive farmers in the respective counties, these county associations gradually gained in members and strength and took over from the more or less self-appointed and partly urban committees the local responsibility and management of the work. Executive committees and officers were elected by the membership, and these officers became the local directing force in the counties. Later, county advisory councils, made up of local community committeemen, were developed to help formulate programs and generally to represent the county association and the College in the communities, and to represent the communities in the county organization.

A counterpart of the county-farm-bureau idea soon began to take form in the county home bureau. In the county association there were developed two equal and coordinate departments — the farm department and the home department — each with its executive committee and advisory council, which together formed the county farm and home bureau association. Still another branch of the work developed later, but on a somewhat different basis — namely, junior extension, or girls' and boys' club work. Because this work was so closely affiliated with the schools, it was put under the local management of a county board for junior extension, made up equally of school officers and farm and home bureau laymen.

The farm-bureau movement not only supplied the need for local representation and cooperation, but also opened the way for adequate financing of the work. The Smith-Lever Act was intended primarily to aid in the employment of county agents, and the funds available under this act were a strong incentive for the employment of agents. Prior to the passage of this act, or in 1912 to be explicit, state legislation had been enacted which authorized the county boards of supervisors to make appropriations for the employment of county agents. In the following year, 1913, further legislation extended the state financial aid "toward the support of county farm bureaus" to the extent of \$600 per county, under the supervision of the Commissioner of Agriculture. In 1914 this supervision was by mutual agreement shared with the Dean of the College of Agriculture through a jointly employed "state leader of county agents." This arrangement was made a part of the law in 1917. Thus a total of \$1200 of state and federal funds was made available for each agricultural agent which the county was ready to help support. State aid to the amount of \$500 per county was extended also to home bureaus in 1919 for the support of home demonstration agents. The state legislation which provided that county boards of supervisors might make appropria-

tions for the local support of the work met with hearty response from the boards of supervisors, who have each year increased their aid so that in 1922 they are appropriating an average of \$4123 for the support of agricultural agents, \$3165 for home demonstration agents, and about \$2526 for junior agents. Further financial aid was made available through the membership fees of persons who joined the county associations. The number of these persons was small at first, but as local control and management grew and vital programs of work developed, the interest of local people increased until there were more than 50,000 men supporting the farm bureau work and 26,000 women the home bureau work. The men have increased their small fee of one dollar to three or five dollars in the majority of cases, so that the average amount of money available for farm-bureau work in a county from this source is more than \$3000 and for home-bureau work nearly \$1000. Thus the counties are providing from \$6000 or \$8000 to nearly \$25,000 each, or about \$550,000 in the whole State, for the financing of county-agent and extension work. This goes a long way toward solving the financial end of the problem.

Organization at the College

In the second period of the development of extension work, we have traced the establishment of a central extension office, and its growth into a Department of Extension Teaching into which were gradually brought all those enterprises of the College which did not concern a particular department alone but which were common to all of the extension work of the institution. The acceptance of the Smith-Lever Act by the State involved still further correlation and centralization of the administration of the extension work. Under the act all the extension work of the United States Department of Agriculture was to clear through the College. To provide for this a cooperative agreement was entered into between the United States Department of Agriculture and Cornell University, the land-grant institution in New York, concerning all extension work in the State.

By this arrangement the College of Agriculture agreed to organize and maintain an extension division, to administer all extension funds through this division, and to cooperate with the Federal Department in all its extension work in the State. On its part, the Federal Department agreed to establish and maintain a States Relations Service and to conduct all of its extension work with the State in cooperation with the College. Together the College and the Department agreed to jointly plan and conduct all extension work within the State, to appoint all agents as joint representatives of the College and the Department, and to establish the headquarters for extension work in the State at the College of Agriculture. This agreement was put into effect in 1914.

Soon after this, Professor Tuck, after a year's absence on sabbatic leave, resigned as professor of extension teaching and in charge of the extension work for the Dean and Director. Professor D. J. Crosby was acting in charge of the Department of Extension Teaching. On July 1, 1917, the several administrative offices, including those already in the Department of Extension Teaching, together with the Office of Publications, the Farm Bureau Office, and the Home Bureau Office.

were brought together in one consolidated Extension Service, and Professor M. C. Burritt, then Director of Farm Bureaus, was appointed Vice Director of Extension and given immediate charge, under the Dean's direction, of the administration of the entire extension service of the College. H. E. Babcock became State Leader of County Agents.

The old and well-established policy of the College which provided for the attachment and residence of all extension teachers or specialists in the subject-matter departments was confirmed and continued. New York has been among the first of the States to recognize and to emphasize the fundamental importance of the extension specialist and of keeping him in the closest possible touch with his subject-matter department in order that he may be thoroughly informed and up-to-date in his subject. It is of first importance that an extension specialist should have something worth while to extend.

The program of work

This third period in the development of extension work has been largely concerned — almost too much so — in the building and development of the organization, or the machinery through which to work. While this machinery has been of very great importance in stimulating the initiative, enlarging the vision, and arousing the desire of farm people to grapple with their problems by educational methods, it has, nevertheless, to some extent involved a danger of too great emphasis on organization — which is, after all, only the means to an end. A good deal of effort has therefore been expended, particularly during the last few years of this period, in focusing attention upon the need of a program of work for the organization.

The first attempt to develop a program of work was made by the county agent leaders in 1915. Charts were worked out at the College indicating the types of problems which the counties were likely to have. These were taken before the advisory councils already described, or selected groups of committeemen from the various communities, who were encouraged to select those which fitted their conditions and to organize them into a county program of work. During the early winter a call for the placing of the work of the farm bureaus on a project basis was sent out from the central office. As a result of this call, together with the meetings held with county committees, some 152 projects were drawn in thirty counties; about 135 of which were in written form. In practically all of these cases the nature of the program was determined by the county agents in consultation with members of their executive committees, on advice and recommendation of their advisory councils. It was required, however, that all projects drawn by the county agents should have the approval not only of the local executive committee, but of the state county agent leader as well.

In the practical working-out of the projects during the season that followed, it was found that many of them were not the ones most needed and that they did not in all cases have the best cooperation of the people in the county. This observation led to the conclusion that, in order to have projects which vitally affected the welfare of the county, the people themselves must have a larger hand in shaping them.

As a result of this conclusion, some thirty project meetings were arranged in the different counties. The entire advisory councils, together with the executive committees and any other specifically interested individuals, were invited to these meetings, at which either the state leader or the assistant state leader was present and explained the plan in detail by the use of charts. At these meetings 740 farmers — practically all picked men and leaders of their communities — were present. They were asked to select those problems which they felt to be limiting factors in their particular counties. Great interest was manifested in discussions, and as a result of these the most important problems in the county were agreed upon. The opinion of the county agent was also asked and taken into consideration, and the executive committee finally passed upon the program in accordance with all the recommendations and its practicability as determined by financial resources, available time, and available assistance from the College, adopting it as a county program. The types of problems contained in these programs are indicated in the following summary:

AGRICULTURAL IMPROVEMENT PROGRAMS IN 31 COUNTIES IN 1916

1. Livestock improvement (29 counties)
 - a. Cow-testing associations
 - b. Milk records
 - c. Feeding demonstrations and records
 - d. Breeding and breeders' associations
 - e. Poultry improvement (5)
2. Crop improvement (31 counties)
 - a. Introduction and development of forage crops, chiefly legumes (25)
 - b. Hay — seeding and fertilizing (19)
 - c. Oat-smut control (18)
 - d. Potato selection and spraying (14)
 - e. Corn — silage varieties and the like (13)
 - f. Fruit — pruning, spraying, and packing (11)
3. Soil improvement (23 counties)
 - a. Liming
 - b. Cover-cropping and humus
 - c. Drainage (5)
4. Farm management (19 counties)
5. More efficient farm-bureau organization (16 counties)
 - a. Increased membership
 - b. Development of advisory councils
6. Cooperation, organization, and standardization (12 counties)
 - a. Organization of breeders' associations
 - b. Organization of cooperative buying and selling associations for the handling of seed
 - c. Organization of cow-testing associations
 - d. Standardization of crops
7. Miscellaneous
 - a. Pasture improvement
 - b. Truck crops
 - c. Grain standardization
 - d. Mustard control
 - e. Cabbage improvement
 - f. Pear-psylla control
 - g. Improvement of the bean crop
 - h. Fertilizers

This general plan was followed for several years, improvements being gradually made in it from year to year. As it came to be better understood, the charts were no longer used. One of the most important steps in improvement was the creation of subcommittees of the advisory council—for example, a livestock improvement committee—which met in the morning of the day of the advisory council meeting to consider special phases of the program and to work out recommendations. The reports of these subcommittees were generally submitted to the meeting and then formulated into a county program to be recommended to the executive committee.

The method of making programs of work still remained more or less unsatisfactory, however. They were generally made upon a county basis, when in reality the community was the unit of need and of effort to carry them out. Under the old plan the county program was presented to the community groups, which made a selection of those parts that were felt to be most applicable and useful in their respective localities. Through a process of evolution the conclusion was finally reached that the only sound way to make a program was to begin in the communities and then assemble these community programs into county programs.

The present plan of program making is, therefore, first to call together the community committee, on which are represented the various important interests of the community, such as dairying, potato raising, poultry, and the like, for agriculture, or food, clothing, health, and the like, for homemaking. These persons discuss the problems in their community, arrive at the important needs, and work out a tentative program to meet them. This program may be based on suggestions made at community meetings. The individuals on the community committee who are concerned with specific problems are called *project leaders*. These community project leaders are often brought together in county committees called *county project committees*. Specialists of the College of Agriculture meet with these county committees and together they make plans for the employment of specific methods or projects to carry out the programs made in the communities. These plans are put together in a county program and made the joint program of work for the county farm bureau and the College of Agriculture for each county.

This method of program making is a great improvement upon any plan previously used. The chief problem is to get this theoretically good machinery to functioning in all the communities and counties, so that vital problems may be really worked out to reasonably satisfactory conclusions. After all, individual thought and initiative are the important factors in progress. The farm and home bureau and the college machinery for community and county program-making are useful means to this end.

SUMMARY OF THE THREE EPOCHS IN THE DEVELOPMENT OF EXTENSION WORK AT THE NEW YORK STATE COLLEGE OF AGRICULTURE

The following is a brief historical outline of the significant facts in the origin, growth, and development of the extension service of the New York State College of Agriculture:

Epoch I — Under the Nixon Act (1894-1904)

(1893) Committee for the Promotion of Agriculture appointed.

1893-94 Chautauqua County farmers asked Director I. P. Roberts, of the Cornell University Agricultural Experiment Station, to undertake experimental work in their vineyards, but were refused because there were no funds to pay for the work.

1894-95 S. F. Nixon, Assemblyman from Chautauqua County, obtained a grant of \$8000 to be expended by the Cornell experiment station "for the purpose of horticultural experiments, investigations, instruction and information, in the Fifth Judicial Department (sixteen counties in western New York). Bill signed by Governor Flower on May 12, 1894.

L. H. Bailey appointed first director of extension work in horticulture.

First extension school held at Fredonia, Chautauqua County, December 26-29, 1894. Enrollment, 58.

1895-96 Four other extension schools held.

Appropriation to Cornell for this work under the "Nixon bill" increased to \$16,000.

A series of "spring rallies" — meetings of one or two days duration — held.

1896-97 First (Bulletin 110, January, 1896) and second (Bulletin 122, December, 1896) reports on extension work in horticulture issued.

Forty bulletins had been issued under the Nixon Act by the close of 1896.

In October, 1896, George T. Powell and John W. Spencer held a series of meetings in many rural schools of western New York, visiting two schools a day, to interest the children in agriculture.

1897-98 The State appropriated \$25,000 to "the College of Agriculture of Cornell University" under the Nixon Act, the purpose of which was now broadened to "the promotion of agricultural knowledge" and its scope extended to the entire State. Direction of the work passed out of the hands of Professor Bailey into those of Director Roberts.

John W. Spencer, John L. Stone, George T. Powell, Miss Mary Rogers, George A. Smith, and W. W. Hall, employed as lecturers and instructors "in conducting university extension work."

More than 100 different experiments planned and prosecuted in western New York.

Forty horticultural schools of two or three days duration had been held up to the spring of 1897.

Third report on *Agricultural Extension Work: Sketch of its Origin and Progress* issued in May, 1897, as Bulletin 137.

Five leaflets issued "to show teachers how nature study may be presented to the pupils." Lectures also given at teachers' institutes for this purpose.

Reading courses for instruction by means of correspondence established. 1600 readers enrolled during the first three months.

Under the head of university extension work, 15,000 pupils and 10,000 teachers in the public schools, and 1600 young farmers, were enrolled.

1898-99 Work under Nixon Act divided into two parts, experimental work at the College and extension work carried on away from the College. Most of the work was extension.

Bulletin 146, the third report on extension work, issued in February, 1898.

Four more nature study leaflets issued.

3000 farmers enrolled in reading course.

1898-99 300 farmers cooperating in sugar-beet culture experiments, and 203 in (cont.) fertilizer experiments.

Two expert dairymen employed to give instruction in butter and cheese factories during the summer.

Total number reached and influenced by bulletins and leaflets, more than 60,000.

1899-1900 Bulletin 159, the fifth report of work under the Nixon bill, issued.

Ten extension schools held during the winter, mostly where reading courses had "made some progress."

Thirteen special dairy schools, "largely in the nature of demonstrations," held in the summer.

22,000 teachers made written requests for 11 nature-study leaflets.

6000 children enrolled in junior naturalists' clubs.

A special lecturer spoke to 14,400 teachers on nature study, in 72 teachers' institutes.

1900-01 More than 400 farmers experimenting under the immediate supervision of the experiment station staff.

Four nature-study quarterlies issued to teachers.

Eight lessons for junior naturalists' clubs issued as *Nature Study Monthlies*.

20,000 farmers registered in reading course.

35,000 school children enrolled in junior naturalists' clubs.

30,000 teachers applied for and received leaflets.

1901-02 First reading-course lesson for farmers' wives, entitled *Saving Steps*, issued. Martha Van Rensselaer in charge of the course.

John Craig made supervisor of farmers' reading courses.

Winter course at College opened.

1902-03 "Thousands of requests for information" overwhelm the station staff.

20,792 students enrolled in the reading course for farmers.

9500 students enrolled in the reading course for farmers' wives.

1800 students enrolled in the home nature study course for teachers.

20,000 students enrolled in the junior naturalists' clubs.

26,000 students enrolled in the junior gardeners' course.

Experimenters' League organized by students in College of Agriculture.

1903-04 Professor I. P. Roberts resigned as Dean and Director after sixteen years of service, and Professor L. H. Bailey was appointed in his place.

Cooperation and helpfulness of Master and officers of State Grange noted.

(1904-05) Reports of departments made under two headings, (1) Federal Experiment Station, (2) Extension Work, the beginning of a sharper differentiation.

426 cooperative experiments on more than 1000 individual plats undertaken in 41 different counties.

Supervision of records of production of purebred cattle for about 75 breeders first noted.

"Discussion paper" replaces "quiz" in reading-course lesson, changing point of view from that of examination to that of correspondence.

(1905-06) 408 cooperative experiments made in 44 counties.

486 junior naturalists' clubs had 14,318 members.

17,800 women registered in reading course for farmers' wives.

Extension work now conducted along three general lines: (1) teaching at the University (the winter courses); (2) correspondence teaching work (reading courses and nature study in schools); (3) demonstrational experiment work on farms in various parts of the State.

Epoch II—Under the State College of Agriculture (1904-1914)

(1903) Experimenters' League organized on March 3.

1904 Act establishing the College of Agriculture of Cornell University, and appropriating \$250,000 for buildings, signed by Governor Odell on May 9.

1905-06 Administration Act providing for the organization, management, and functions of the State College of Agriculture at Cornell University, signed by Governor Higgins on April 12, 1906.

\$100,000 appropriated for maintenance.

60,000 letters sent out from College.

- 1906-07 Need for enlargement for extension work emphasized.
Agricultural surveys emphasized.
Nature study became a part of school curriculum.
Department of Home Economics established.
- 1907-08 First specific appropriation made by the State for extension work, \$10,000. Charles H. Tuck appointed Assistant Professor of Extension Teaching and head of Extension Office.
Experimenters' League reported membership of 800 persons.
Need of extension work in home economics emphasized.
First Farmers' Week attended by 800 persons.
- 1908-09 Two farm trains run in cooperation with Erie and New York Central Railroads for the first time. 25,000 persons reached.
2000 persons attended second annual Farmers' Week.
Sixteen departments of College exhibit at State Fair. Exhibits held at twenty town and county fairs.
500 experiments conducted in cooperation with Experimenters' League.
Twenty-four farmers' wives' reading clubs had a membership of 549.
First housekeepers' conference held during Farmers' Week.
Professor Tuck as conductor of farmers' institutes arranged 25 demonstration field meetings.
- 1909-10 40,000 persons reached by farm trains in cooperation with seven railroads. 23,590 persons addressed at single extension lectures.
106,240 persons on college mailing lists.
Inquiries addressed to Extension Office of College on 1463 subjects.
Correspondence conducted with 10,309 persons in 60 counties.
450 cooperative experiments conducted.
- 1910-11 Appropriation for extension work increased to \$50,000.
Total persons reached with extension work, about 300,000.
194 lectures given in 40 counties to 21,560 persons.
112,077 persons reached through fair exhibits.
Extension schools resumed, and three held with a total attendance of 157.
John H. Barron appointed first county agent in New York, in Broome County, on March 1, 1911.
- 1911-12 Department of Extension Teaching formally organized.
Exhibits sent to State Fair and to 26 county fairs were seen by 245,000 persons.
Ten counties appointed local representatives, or county agents.
County boards of supervisors authorized by Legislature to make appropriations for the support of county agents.
First school for country life leadership held at College, with 23 persons in attendance.
- 1912-13 Dr. L. H. Bailey retired as Dean and Director on August 1, 1913.
Lloyd S. Tenny appointed first State Leader of County Agents representing College and United States Department of Agriculture on March 1, 1913. Nine county agents already employed at that time. Nine others added during year.
State aid at the rate of \$600 per county made available by law for the support of county farm bureaus.
Seventeen counties had local representatives for extension work.
The College *Announcer* was inaugurated, together with a press service to 250 newspapers in the State.
- 1913-14 Dr. B. T. Galloway appointed Dean and Director.
Agreement with State Department of Agriculture for joint supervision of county agents and farm bureaus through state leader of county agents.
Professor Tenny resigned on December 1, 1913, and on January 1, 1914, M. C. Burritt was appointed Professor of Extension Teaching and State Director of Farm Bureaus in his place, in cooperation with the State Department of Agriculture as well as with the United States Department of Agriculture.
H. E. Babcock appointed Assistant Director of Farm Bureaus on December 1, 1913.
Total number of farm bureaus and county agents reached 26 during year. County associations contributed \$26,994.61 toward their support.

- 1913-14** Extension meetings to the number of 469 attended by 48,420 persons.
 (cont.) Attendance at Farmers' Week reached 3500 persons.
 61 extension schools held in 31 counties, with an average attendance of 40.4.
 Educational exhibits at fairs reached 390,000 persons.
 Six traveling schools conducted in cooperation with railroads, reaching 20,083 persons.
 Membership in Experimenters' League reached 999, but the number of experiments carried on fell to 42.
 Number of letters received by the Extension Department at the College, 39,715.
 Federal Smith-Lever Extension Act signed by President Woodrow Wilson on May 8, 1914.

Epoch III—Under the Smith-Lever Act (1914-1922)

- 1914-15** Memorandum signed between Cornell University and United States Department of Agriculture covering all extension work in the State.
 Number of farm bureaus reached 30.
 First home demonstration agent employed in Erie County.
 Information service organized with Professor Bristow Adams in charge.
- 1915-16** Professor E. L. Griffin appointed first State Leader of Junior Extension.
 Field work with girls and boys begun in several counties.
- 1916-17** Dr. B. T. Galloway resigned as Dean and Director, and A. R. Mann was appointed Acting Dean.
 Four more counties employed home demonstration agents and organized home departments in farm bureaus.
 Dean Mann and M. C. Burritt, Director of Farm Bureaus, appointed on State Food Supply Commission to assist in stimulating food supply.
 College issued 1,912,000 copies of 64 publications containing 4773 pages.
 Professor C. H. Tuck resigned after a year's leave of absence, Professor D. J. Crosby acting in his place.
 Provision for joint supervision of county agent work by College and State Department of Agriculture incorporated in law.
- 1917-18** A. R. Mann made Dean of the College and Director of Extension.
 On July 1, 1917, the former Department of Extension Teaching, the Office of Publications, the Central Office of Farm Bureaus, and the newly established Central Office of Home Demonstration Agents, were combined to form the Extension Service under the headship of Professor M. C. Burritt, who was made Vice Director of Extension.
 H. E. Babcock appointed County Agent Leader.
 Extension Service, including county-agent system, devoted much time to war-emergency work.
 County farm bureau organization completed and agricultural agents employed in all 55 agricultural counties. Total membership in county associations, 45,500.
 Florence Freer appointed first State Leader of Home Demonstration Agents.
 Five permanent and 32 temporary war-emergency agents with 20 assistant home demonstration agents now employed.
 Extension service organized in four offices—(1) Administration, (2) Publications, (3) Agricultural Agent Leader, (4) Home Demonstration Agent Leader.
- 1918-19** Farmers' institutes transferred by Legislature from Department of Farms and Markets to College of Agriculture.
 Professor E. L. Griffin resigned and Professor W. J. Wright was appointed State Leader of Junior Extension.
 In April, 1919, Office of Home Demonstration Agents transferred to Department of Home Economics and made an integral part of the work of that department.
 State aid at the rate of \$500 per county extended to home bureaus for employment of home demonstration agents.
 Publication of *Extension Service News*, continuation of *Farm Bureau News*, begun.
 Number of farm bureau members reached 66,735.

1919-20 First Farmers' Field Days, or Summer Farmers' Week, held in June and July, 1920.

Total contacts made by Extension Service with people of State reached 1,038,233.

Farm bureau membership fees raised from \$1 to \$2.

County farm and home bureau associations provided for by law, being perfected in the counties.

H. E. Babcock resigned, and Jay Coryell was appointed County Agent Leader.

1920-21 Tenth anniversary of establishment of county-agricultural-agent and farm-bureau work in New York State celebrated at Binghamton on March 21.

Farmers' Week had record registered attendance of 4116 persons.

Extension work with Indians inaugurated on the Indian reservations.

Correspondence courses inaugurated to supplement reading or farm study courses.

Extension work in rural social organization inaugurated.

County farm bureau associations began to raise membership fee to \$5.

1921-22 Distribution of bulletins on lists discontinued, and bulletins sent out only on request.

Professor D. J. Crosby relieved of administrative duties and assigned to the study of extension methods.

Full responsibility for administration and supervision of county-agent work placed upon Cornell University by change in farm and home bureau law.

Number of extension schools held reached record of 67 schools, with registration of 2468.

Extension specialists in service totaled 33 on full time, 21 on half time or more, and 21 on less than half time, together with 9 special field assistants employed on a six-months basis.

Total number of agents, 132: agricultural 55, assistants 10; home demonstration 33 county and 3 city, assistants 8; junior extension 20, assistants 3.

Total farm bureau members, 42,316; home bureau members, 27,619.

Funds available for extension work in 1922-23: from federal sources, \$210,590.11; from state sources, \$329,480.00; from county sources, \$546,428.46; total, \$1,086,498.57.

Total contacts made by Extension Service in twelve months, 1,374,349.

Total copies of 75 publications of 3740 pages, 819,000.

PRESENT STATUS OF EXTENSION

Having traced the extension work through the periods of origin, development, and permanent organization, we shall now examine its present status as to organization and accomplishment. Both these viewpoints are revealed in the summary reports of the various divisions and departments for the current year. The status of the field organization, or the county-agent system and its cooperating agencies, is presented first.

The field organization

County agents and farm bureaus

In 1921 the total farm bureau membership amounted to 49,593. On June 30, 1922, the membership was 42,316. The membership is in a transitory stage, the tendency being toward a \$5 continuing-membership basis.

Twenty-five counties have adopted a \$5 fee, twenty-five counties a \$3 fee, and five counties a \$2 fee. The State Farm Bureau Federation

has taken the leadership in membership work and has assisted most of the \$5 counties, and many of the \$3 counties, in conducting membership campaigns. Heretofore the membership has been secured almost entirely through freewill solicitation on the part of committeemen. The tendency is now to use a county campaign organizer with a corps of paid solicitors. The local committeeman furnishes the conveyance and introduces the solicitor to the farmers. Great care has been exercised to see that farmers understand the service they may receive through membership in the farm bureaus, and to avoid the possibility of leading them to expect the impossible or the unlikely.

The farm and home bureau executive committee is the force behind the work in the county which makes the efforts of county agents and farm bureau committeemen effective. The extent to which these committees function may be judged when it is stated that last year the 55 farm bureau executive committees held 449 meetings with a total attendance of 3344, this being an average of 8 meetings per county and 7.4 persons per meeting. The men elected to the executive committees take the responsibility of administering the piece of work from a local standpoint. One of the greatest accomplishments of farm-bureau work is the development of such local responsibility and leadership.

Project committees composed of a few outstanding farmers in each county who are qualified and willing to exert a high degree of leadership along their particular lines of farming, have been successful with their work. Results seem to indicate that the county project committee is the best method yet devised for crystallizing thought and effort on the various projects undertaken in the county. Together with the extension specialist the project committees study the programs as worked out by the community committees, and crystallize the thought into a well-rounded project which fits into the general county program. Before the end of the present year it is expected that project committees will be functioning on important projects in all of the counties, the idea being to develop the largest possible degree of program leadership on the part of farmers who are members of the county project committees.

The work in the community centers around a community committee made up of leading farmers who are willing to devote time and effort to the making and carrying-out of a definite community program. The tendency is now for each one of the community committeemen to assume responsibility for carrying out a certain project in his community. The assuming of definite responsibility, and a thorough understanding on the part of committeemen as to just what needs to be done, will very materially increase the effectiveness of the extension program.

Finances

The farm- and home-bureau work is financed mainly from three sources: by the State and Federal Governments through the public agricultural institutions; by county boards of supervisors; and by membership fees. In 1921 the total amount of money available for farm- and home-bureau work from all sources amounted to \$720,454.38, giving an average county budget of \$15,634.62. In terms of percentage the receipts are as follows:

	For farm- bureau work (per cent)	For home- bureau work (per cent)	Total for farm- and home- bureau work (per cent)
New York State through Department of Farms and Markets.....	5.78	8.87	7.33
Smith-Lever funds through College of Agriculture..	7.52	14.19	10.86
County boards of supervisors.....	41.01	45.45	43.23
Membership fees.....	23.45	13.25	18.35
Contributions.....	1.17	1.79	1.48
Advertising in <i>Farm Bureau News</i>	7.99	1.42	4.70
Loans.....	3.23	3.21	3.22
Miscellaneous.....	7.62	8.25	7.93
Balance from preceding year.....	2.23	3.57	2.90

Personnel

The county agents are well trained, industrious, and conscientious. Extreme caution is being exercised in choosing assistants, with the idea that men so chosen will be well qualified to accept county-agent positions as they occur. Practically all of the vacancies in this State are filled by men who have served apprenticeships as assistants. The importance of this policy is readily seen when it is considered that there were changes in agents in seventeen counties during the past year. County-agent work furnishes so fine an experience that the call on the personnel from other lines of work at high salaries is constant and effective.

Correlation of county programs

Several steps have been taken to correlate the county programs so that the efforts of county agents, extension specialists, and farm bureau committees might be focused on a common program. The first step in this direction was taken at the county-wide advisory council meetings in the fall of 1921, when a representative of the Central Office attended the meeting in each county for the purpose of urging upon the county agents and the farm bureau committeemen the desirability of such correlation. Extension specialists also, during this period, met with project committees in many of the counties, which resulted in again focusing attention on this object.

The second important step in this procedure was carried out at a series of five district conferences of county agents and specialists, held from March 20 to March 29. At these conferences each subject-matter specialist conducted a round-table discussion, at the beginning of which he outlined the essential points in his particular project. During the conference each county agent was given an opportunity to discuss questions of individual interest and to clear up points not fully covered in the round-table discussion. A portion of each conference was assigned to a discussion of principles underlying extension work. Another session was devoted to a discussion of community organizations, and very thorough consideration was given to the question of the ways in which

the county agent could best function with the community committeemen to secure desired results in carrying out community and county programs of work.

The third step in correlation was a careful analysis made in each county of the work of the previous year in relation to the county program for that year, together with plans for strengthening the program for the year to come. This study was made at the request of the county president and the county agent. It showed the balance of the program in relation to important agricultural interests and its distribution in the communities. The results of each study were summarized in charts and graphs, and discussed with the executive committee. A complete report of findings by projects and by counties was made, and a copy of the part which concerned his work was placed in the hands of each specialist. A second visit to the county was made later in order to help agents in carrying out the plans made at the first conference.

This analysis has resulted in the general acceptance of the community plan of work by both committees and agents. It has centered attention and thought on methods by which both committeemen and agents can give the most effective service in developing community programs of work.

Trend of development

The farm- and home-bureau work is in a stable condition. Adequate finances are available for the remainder of the year and will be spent where the most good can be accomplished. The work is educational in character, commercialism being avoided. Moral support is at all times given to the cooperative idea, but farmers are advised that they should do the work themselves through specific agencies and not depend on a public agency to do it for them.

Through the larger membership fee, farmers are assuming a greater degree of financial support. With this increased financial support there comes a greater degree of interest in the program of work. It is probable that before the end of another year practically every county will be on a \$5 membership basis, and it is hoped that the total membership of the bureaus will be very materially increased.

The tendency is distinctly toward the fixing of definite goals for extension work in the counties. In this way the thoughts and efforts of committeemen, as well as of members, will be centered on the needs of the agriculture of the county as determined by the farmers themselves.

Home demonstration agents and home bureaus

Historical

The first home demonstration agent in New York State, as well as in the Northern and Western States, was employed by the Erie County Farm Bureau Association in May of 1914. In the beginning the work of this agent was under the general direction of the county agricultural agent. Later a home economics department was established in the Erie County Farm Bureau Association. At first it, like the home demonstration agent, was subordinate, but it was soon given equal and coordinate status with the agricultural department, and the home demonstration agent was made responsible directly to the executive committee. This was the beginning of home bureaus in the State.

Similar departments were established and home demonstration agents employed in Otsego, Jefferson, and Cortland Counties on July 1, 1916. Nassau County took up the work on a similar basis on July 1, 1917. These five counties were already organized on a permanent basis when the United States entered the World War.

As a result of war-emergency measures to increase the food supply, the College of Agriculture had available federal funds for the employment of war-emergency agents. Such agents were appointed as joint representatives of the United States Department of Agriculture, the State College of Agriculture, and the State Food Supply Commission, in thirty-eight counties and seven cities.

At the conclusion of the war the College made its support and cooperation in the continuance of these agents conditional upon the organization, by the county farm bureau association, of a representative membership department with a minimum number of 300 women affiliated and paying membership dues, and the local provision of a minimum amount of \$1500 through appropriation by the board of supervisors, membership fees, and other sources. Twenty-five counties and two cities qualified under these conditions the first year, and the work was continued in these counties and dropped in the others.

Although the intention from the first was to organize the home bureau as a coordinate department with the farm bureau in the county association, this was not altogether possible until sufficient membership and financial support became available. In 1918 a vigorous effort was made to strengthen the home bureau departments. This resulted in a membership of about 10,000 women in twenty-five counties and two cities, and substantial increase in county appropriations. In 1919 the state farm bureau law was modified so that state aid was available for the support of home bureaus to the extent of \$500 per county.

At first, supervision of the home-demonstration work was by a home demonstration agent leader who was an assistant to and was established in the office with the county agricultural agent leader. After about a year the home demonstration agent leader's office was transferred to the Department of Home Economics at the College, and in 1920 the head of the then School of Home Economics was made state leader of the home-demonstration work and given the immediate supervision of the work of home demonstration agents. The county agent leader is responsible for the supervision of both the county farm and home bureau organizations, their finances, general policies, and so forth, but he exercises his functions under the law in the supervision of home demonstration agents through the home demonstration agent leader and her associates.

Present status

The past year has been characterized by successful efforts to strengthen the existing community, county, and city units of the home bureau division of the Extension Service; by the addition of four home bureaus, in Madison, Ontario, Genesee, and Cattaraugus Counties, respectively, making a total of thirty-three county and three city units; by initial steps toward the development of home bureau departments in seven other coun-

ties; by increased moral and financial support of the work by the people; and by a more effective local participation of the gifted but latent leadership of farm women in giving direction to the work so as to adapt it to local needs.

Memberships. New York is fortunate in having a large number of homemakers identified with the home economics extension service. There are 27,619 members in the home bureaus at the close of the past fiscal year (June, 1922), or an average of 767 members in each county. This is an increase of 5133 members over 1921. In addition, there are in all over a thousand members in several counties that have not yet fully qualified for home-demonstration work.

Organization. The membership mentioned above is organized in three city and thirty-three county units, which more than two years ago united in the first state federation of home bureaus in the United States, a statewide organization of homemakers that has since been introduced in other States. The county home bureaus are further organized into rural community groups for purposes of administration and instruction. There are now 932 rural committees organized for home-bureau work. Preliminary organization work is going forward in seven counties — Warren, Franklin, St. Lawrence, Schoharie, Chautauqua, Orange, and Seneca. Some of these will be ready for home demonstration agents in January of 1923.

Financial support. There has been a steady annual increase in the local financial support given the home bureaus. In many counties, however, the resources are still inadequate, and yet the home bureaus are attempting to do a piece of work comparable to that done by the farm bureaus, although the farm bureau budgets are on the average from two to three times as large as those of the home bureaus.

The average county appropriation for 1922 was \$3165.36 (the extremes being \$1500 and \$6640), and the average funds from memberships \$765.20 (the extremes being \$320 and \$1435), making an average total of \$3930.56 of local funds as compared with an \$1100 subsidy from the State and Federal Governments.

It will be necessary to secure added resources if the home-bureau work is to realize its finest possibilities. The field has grown too large for one agent without the aid of an assistant agent, an efficient secretary, and certain mechanical aids which are expensive. Some additions to the county appropriations may be expected in the counties that are below the average, and some raising of the minimum and the average will be undertaken. But the probabilities are that the membership dues of \$1 a year will be raised at the initiative of the homemakers themselves, as more and more of them catch the vision of the meaning of the home-bureau work, not to themselves alone but to all home and community life.

County club agents and the junior extension organization

Historical

As we have seen, work with girls and boys has always been recognized as a vital part of the extension work of the State College of Agriculture at Cornell University. Long before the Smith-Lever Act was passed,

a definitely organized program for nature study was in operation under the leadership of Mrs. Anna B. Comstock, "Uncle" John Spencer, Miss Alice McCloskey, and others.

Following the passage of the Smith-Lever Act in 1914, emphasis was given to a program of work with girls and boys having a more specific application to practical homemaking and agricultural problems. For the most part, this work in its early stages was conducted by county agricultural and home demonstration agents under the direction of Professor Martha Van Rensselaer as state club leader.

Early in 1915 an agreement was entered into by the College and the State Education Department defining relationships and policies to be observed in the conduct of junior extension work, and the work at the College was placed under the supervision of the Department of Rural Education. At this time Professor C. O. DuBois, of the State School of Agriculture at Alfred University, was made a district agent for junior-extension work and became the first paid junior extension or club agent employed in cooperation with the State College of Agriculture in the State. Prior to this time, however, Rufus Stanley, of Elmira, had been conducting girls' and boys' clubs in Chemung County, a part of the time in cooperation with the United States Department of Agriculture. On February 1, 1916, F. L. Griffin was made Extension Professor of Rural Education and State Leader of Junior Extension. Cooperative relationships similar to those existing with the State School of Agriculture at Alfred University were soon after arranged with the other special state schools of agriculture in the State. Several district superintendents of schools also became interested. The superintendents organized junior-extension work in many of the schools in their supervisory districts and gave considerable time to its supervision. This interest was quickened through the rise of patriotic feeling due to our participation in the war. The appropriation by the Federal Government of the so-called war-emergency funds for stimulating food production, and the establishment of county boards for local defense, made possible the employment of a large number of local and district extension leaders. In four cases—Nassau, Putnam, Montgomery, and Chemung Counties—the work started under this war-emergency program has become permanent. In other counties the falling-off of interest after the armistice resulted in the discontinuance of the work.

The withdrawal of the federal and local war-emergency funds, and the general apathy following the armistice, made it clear that if junior-extension work was to become permanent it must be under the direction of trained local leadership and local provision must be made for financing. It was apparent that, under the county farm and home bureau law, boards of supervisors had the authority to make appropriations to the associations for junior-extension work. The State Education Law also makes provision for the refunding of a part of the salary of "directors of agriculture," whose functions and duties, though limited as to area, are essentially the same as those of junior extension or club agents. Early in 1919 steps were taken looking toward the establishment of a county organization to assume local responsibility and to provide for the full utilization of federal, state, and county funds. This resulted in a sup-

plementary memorandum of understanding with the State Education Department, which was finally approved in March, 1920, whereby the local direction and administration of junior-extension work in counties is vested in a county board for junior extension, which is composed of the district superintendents of schools in the county and an equal number of representatives of the farm and home bureau associations, and may include representatives of such other organizations in the county as may be mutually agreed upon. By this memorandum the College of Agriculture agrees, so far as funds permit, to assist in the payment of the salaries of county junior extension leaders to the extent of \$600 a year, and the State Education Department agrees to refund an equal sum when the provisions of the "Director of Agriculture" law are met. The balance of the funds necessary for the employment of an agent are raised by the county.

Rensselaer County was the first to take advantage of this arrangement, and perfected a county board for junior extension in the fall of 1919, a full-time junior extension leader being employed from January 1, 1920. During the year 1920, seven counties — Chenango, Erie, Livingston, Oneida, Otsego, Rensselaer, and Westchester — were organized and employed full-time junior extension leaders. Since then the work has made a steady and consistent though gradual growth.

Present status

There are now employed cooperatively 16 full-time county club agents, 4 half-time county club agents, and 3 full-time assistant county club agents, in charge of the homemaking program. In addition there are 3 district agents, paid entirely from local and state funds, who are conducting junior-extension work according to the state program but without financial aid from the College. In addition to these paid leaders, there are 1067 local leaders acting under the direction of the county club agents. Of these local leaders, 598 are teachers and 469 are community or lay men and women having no professional connection with the school system. A great majority of these local leaders are engaged in the home-making projects. They report monthly to the county club agent and are expected to attend at least three conferences during the year.

Enrollment. The total official enrollment of boys and girls in junior-extension work on June 1, 1922, was 13,589 of whom 10,489 were in counties employing county club agents and 3100 were in counties not employing county club agents. Data regarding enrollment and results for the past three years are given in the following table:

Project year	Enroll- ment	Number reporting	Value of products
1919* .....	.....	14,817	\$224,536.15
1920	11,856	7,909	186,164.70
1921	15,064	9,681	205,930.38
1922	13,589	9,377	197,855.96

* Includes reports of school-garden army workers in towns and villages.

Subject-matter projects. Considerable progress has been made in the enlargement of the scope of the various projects by better organizing them and relating them more closely to the agricultural and homemaking needs and practices of the communities. While considerable freedom is given to girls and boys in the selection of the projects which they wish to conduct, there is a growing tendency for county junior extension boards to limit the projects to be fostered within the county or to particular sections of the county. The enrollment by projects for 1922-23 is as follows: garden, 2447; corn, 209; foods, 1025; poultry, 2850; cow-testing, 67; sheep, 71; canning, 218; forestry, 1; potato, 1200; bean, 48; clothing, 4152; calf, 534; pig, 219; rabbit, 105; bees, 3; farm-account, 4; total, 13,153. The subject-matter material for these projects is furnished by the specialists concerned. The work as a whole is under the supervision of a state leader of junior extension who has his office with and is a member of the Department of Rural Education at the College.

Local or community organization. As a direct outgrowth of the local leadership program there has come a need for addition local direction. This is particularly true where the local leaders are teachers with little or no knowledge of community needs. The first plan was to have an assistant local leader to advise with the teacher, but this is now developing into a local community or neighborhood committee which assumes some responsibility for the development of the work and aims to give inspiration to the leader and continuity to the work from year to year. The formation of these community committees necessarily proceeds slowly, though considerable progress is being made.

Cooperation with vocational teachers. A definite plan has been outlined with the State Education Department, with whom all junior work is closely cooperative, for cooperation with vocational teachers. This plan provides that vocational teachers may become local leaders for junior-extension work in the district which they serve or in a definitely prescribed area. These vocational teachers conduct the work under the regular state program. In counties organized for junior-extension work they report to the county club agent. In unorganized counties they report to the state junior extension leader. Twenty-seven vocational teachers of home economics, and thirty-eight vocational teachers of agriculture, are cooperating.

Finances. At present the greater part of the local funds for junior-extension work comes from public sources through appropriations by the county boards of supervisors. In some counties some supplementary funds are made available through contributions by county bankers' associations, granges, farm cooperative associations, and other societies. This is particularly true in some of the more recently organized counties, it being understood that these contributions from private and corporate sources cannot be expected to continue after the first two or three years. An analysis of the various budgets shows that the average junior extension budget for all counties employing club agents is \$3581.93, for counties employing two full-time agents \$7894.37, and for counties employing one full-time agent \$3159.96. The average salary paid to club agents is \$2091.12, and the average appropriation of county boards of supervisors for club work is \$2510.83.

Results. It is difficult to measure the results of educational work with young people. The full results are not apparent until manhood or womanhood is reached. Even then there are no adequate checks on which to base definite conclusions. It is agreed, however, that education pays. The main problem, then, in junior-extension work is to see that it is conducted on lines which have proved to be successful in other types of educational work, with such modifications as may be necessary because of the nature of the work and the limitation of supervision. Measurement in terms of production are far from satisfactory.

In junior-extension work, which involves the conduct of a specific home activity — for example, the raising of an acre of potatoes — there are certain by-products or results which may be rather definitely measured in terms of effect on the general practice in the community. One county club agent reports that sixteen farmers in one community are testing potato seed for disease as the result of the work of one boy's project. Another reports an organized plan for the improvement of a local cemetery as a result of the garden club. Many report increased interest in the local schools on the part of the parents as a result of the work of teachers and children in the agricultural and homemaking projects, even to the extent of furnishing additional equipment and in some cases additional classrooms. Others report the establishment of vocational departments of homemaking and agriculture as a result of junior-extension work conducted in the community.

That there is a growing interest among the people of the State in extension work in agriculture and homemaking for young people is evidenced by the large number of inquiries received for information concerning the work. Its development on a paid-leader basis is limited by the difficulty of obtaining the necessary local funds. The campaign for economy in public expenditures has made it extremely difficult to obtain appropriations from boards of supervisors for starting the work in new counties.

Subject-matter departments

Seventeen subject-matter departments in the College are now doing some extension teaching through specialists employed on full or part time for that purpose. Fifteen departments employ 33 specialists who give full time to extension work, 21 specialists who give half of their time or more, and about 21 specialists who give less than half of their time. The number of extension specialists in each department ranges from one to five. These specialists conduct practically all of their field work in cooperation with the county farm and home bureaus, the junior extension boards, and the county agents.

The subject-matter departments are responsible for the extension teaching in their respective fields and for keeping the county agents informed and up-to-date in their subjects. The extension specialists are expected to exercise leadership in their particular fields, so far as they are able to secure and command it, through the necessity and the value of the service which they render county agents, committeemen, and farmers generally. To a considerable extent, also, they are responsible for methods used in teaching, although this is partly a matter of cooperation with the central

office and the county agents in the different counties. Each department generally uses one or two particular methods to a much greater extent than it does others. The Department of Rural Engineering, for example, places special emphasis on schools, and the Department of Poultry Husbandry on field demonstrations, while the Department of Home Economics emphasizes local leadership. Moreover, methods used are more or less seasonal. With crops, for example, the demonstration method can be used to best advantage only in summer, while schools and meetings lend themselves much better to the winter season.

In the following presentation of the results of the work of the subject-matter departments, it will be apparent to the reader that most of the things accomplished are due to the joint efforts of extension specialists and county agents, and that no one can claim exclusive credit for the results. Since the work is educational also, it will be recognized that it is much easier to outline the activities than to measure the educational development, but certain results can be given that are indicative of what is being accomplished. The general activities common to the whole extension service, such as publications, Farmers Week, Farmers Field Days, fairs, extension schools, and meetings, are presented first. Then the specific lines of work, their results, and the activities of each department, are briefly sketched.

Personnel

Professors M. C. Burritt and Bristow Adams have been absent on sabbatic leave during a part of the past year. Professor D. J. Crosby has been relieved from administrative duties and responsibilities in the Extension Office in order that he may devote his time exclusively to the study of extension methods used in extension service. He will devote his time primarily to gathering information and data and attempting to determine the relative effectiveness of various methods, both of specialists and of county agents, particularly in field work. It is expected that the results of these studies will be incorporated into courses in extension methods for the preparation of extension workers.

General or common activities

Publications

The Office of Publication is an integral part of the office of the Vice Director of Extension, one of the administrative divisions directly attached to the Dean's office. The work of this office is extensive and consists of four main divisions: (1) the editing and distribution of publications, including both experiment station and extension publications (the latter embrace the farm-study courses and the farmers' reading series); (2) a news service to the newspapers of the State; (3) the editing and distribution of the *Extension Service News*; (4) miscellaneous functions, including matters connected with illustrations and cut and other special service.

The thorough revision of the college mailing lists for popular bulletins is one notable accomplishment of the past year. In this revision, in order to have his listing retained, a person must return a card on which he must first affix a one-cent stamp. As a result of the revision of the pa

year, the total number of names on the lists is now 78,129, as compared with 130,244 a year ago.

In accordance with the action of the Committee on Publications, the use of the mailing lists for the direct distribution of popular publications will be curtailed with the close of this fiscal year. This action was taken for two reasons: first, the increased cost of printing; and secondly, the belief that distribution only on direct request for specific publications will deprive no one of material that he can use, while it will eliminate the waste that must inevitably result from list distribution, no matter how carefully it is safeguarded. No change will be made in the distribution of publications to library and similar lists, the distribution of technical papers to persons engaged in the lines of research with which they deal, or the distribution of the Rural School Leaflets to rural-school teachers and pupils.

Printing. As a result of a change in the state law it has become possible to make a considerable saving in the printing of the extension and experiment station publications by letting the contracts by competitive bidding instead of having all the work done by the state printers, as formerly.

Other activities. The nature of the annual community newspaper conference which is now a feature of Farmers Week was changed somewhat this year, and prominent newspaper men presented talks on various phases of country newspaper publishing. This office has also been interested in the little-country-theater movement, and has cooperated not only in publicity but also in other ways with the Department of Rural Social Organization and with the State Fair Commission.

The news service. The office has continued its established practice of supplying the newspapers of the State, and the farm bureau publications, with timely agricultural information furnished by the subject-matter departments of the College. During the year 775 articles were sent out. Although in the interest of economy it was necessary to discontinue the clipping service, which enabled the office to know with reasonable accuracy how extensively the matter was used, news clippings obtained through other sources make it evident that the monthly circulation of twelve million reported last year has easily been maintained if not exceeded. The growing realization by publishers, including publishers of city papers, that the farming constituency is one not to be ignored, has led to an increased use of the college matter, which is prepared with a view to helping the newspaper and its readers.

Opportunities for home study. During the year the two classes of home study work have been still more clearly differentiated by changing their nomenclature. The series of bulletins formerly called *Cornell Farm Study Courses* are now designated as *Farmers' Reading Series*. It was felt that they were in no sense "courses," since their discussion papers are not marked but are used merely as a check on the reader's interest and as a convenient way for readers to ask for help from the College. The term *Farmers' Reading Series* more accurately describes what is offered in this way. The former *Advanced Study Courses* are now called *Cornell Farm Study Courses*, and are frequently spoken of as "corre-

spondence courses." It is in these that the greatest development has taken place during the year.

The requirement of practical work as a part of the correspondence courses has tended to restrict enrollment to persons living on farms or at least having access to farm work and records, while those taking the reading series come from both city and country.

Cornell Farm Study Courses. Subject-matter departments, through their extension specialists, have prepared three new correspondence courses during the year. These are in animal breeding, milk production, and small fruits. The old course in vegetable gardening was completely rewritten and new outlines were prepared both for study and for practical work, and the farm crops course was closed to new students until it could be replaced by a course or courses from the Department of Agronomy. At the present time, the only one of the seven active courses that remains as it was before July, 1920, is that in orchard fruits, and the Department of Pomology plans to rewrite that during the coming year. Courses in dairy industry and floriculture also are contemplated.

On June 30, 1922, the number of persons taking the eight correspondence courses was 315, as compared with 88 taking the five courses one year ago. During the year 341 persons have registered as compared with 102 the previous year, 2242 reports on lessons and practical work have been received and marked by the College as compared with 422 the year before, and five certificates for successful completion have been authorized by the faculty.

A comparison of the records for May, 1922, with those for May, 1921, shows 313 reports received from 317 students (11 of whom were enrolled during the month) in 1922, as compared with 57 reports received from 95 students (2 of whom were enrolled during the month) in 1921.

Besides the textbooks which students in these courses are required to buy, 28 college bulletins and 31 Farmers' Bulletins from the United States Department of Agriculture have been used as free supplementary reference material, in addition to numerous blanks and forms provided by departments.

Farmers' Reading Series. A total of 1801 of the Farmers' Reading Series, in seven subjects, have been started by residents of the State during the past year. Of these, 385 have been finished. This compares with 1856 series in eight subjects during the year ending June 30, 1921. During the past year 5042 discussion papers have been returned, as compared with 3426 the year before. At the end of 1921-22 this series comprises seven subjects: farm crops, soils, home gardening, fruit, dairy, livestock, and flowers. It includes 76 popular college bulletins and 17 Farmers' Bulletins from the United States Department of Agriculture.

Distribution of bulletins. During the fiscal year the mailing room distributed 1,257,413 publications. Of these, approximately 75 per cent were mailed out through mailing lists on which names had been entered on previous personal request, and 25 per cent were distributed in response to specific requests received through the mail or on application made at the mailing room. The number of requests for publications received by mail each month averaged more than two thousand. During the year the

College issued 75 new publications with 3740 pages, besides the regular monthly periodicals, the *Extension Service News* for extension workers and the *Service Sheet* for country publishers. In addition to this, the office prepared numerous posters and other similar pieces of publicity for extension schools and other types of extension meetings.

List of publications. The regular publications constitute a part of the annual report of the College and are issued separately as bulletins in various series. Copies of any of them may be obtained on application to the Office of Publication, College of Agriculture, Ithaca, New York, as long as the supply lasts. The list of publications follows:

MEMOIRS:	Number of pages in printed publication	Number of copies printed
40 Liberation of organic matter by roots of growing plants (Agronomy)	44	4, 500
41 Lysimeter experiments — II. Records for tanks 13 to 16 during the years 1913 to 1917 inclusive (Agronomy)	49	3, 500
42 Bean anthracnose (Plant Pathology)	121	6, 000
43 Variations in bacteria counts from milk as affected by media and incubation temperature (Dairy Industry)	31	3, 500
44 Attachment of the abdomen to the thorax in Diptera (Entomology)	58	3, 500
45 The Botrytis blight of tulips (Plant Pathology)	53	4, 500
46 A classification of the cultivated varieties of barley (Plant Breeding)	94	5, 000
47 Typha insects; their ecological relationships (Entomology)	75	3, 500
48 The inheritance of salmon silk color in maize (Plant Breeding)	22	5, 000
49 The biology of <i>Ephydra subopaca</i> Loew (Entomology)	62	3, 000
50 The relative growth-promoting value of the protein of coconut oil meal, and of combinations of it with protein from various other feeding stuffs (Animal Husbandry)	17	3, 600
51 The hog louse, <i>Haematopinus suis</i> Linné; its biology, anatomy, and histology (Entomology)	109	3, 000
52 Studies in pollen, with special reference to longevity (Botany)	49	3, 600
53 The genetics of squareheadedness and of density in wheat, and the relation of these to other characters (Plant Breeding)	88	3, 600
54 Horse raising in colonial New England (Agricultural Economics and Farm Management)	59	4, 500
55 Insects and other animal pests injurious to field beans in New York (Entomology)	95	4, 000
56 The insect fauna of the genus <i>Crataegus</i> (Entomology)	98	3, 600
57 A study, by the crop survey method, of factors influencing the yield of potatoes (Vegetable Gardening)	147	4, 000
58 The biology of the Chrysopidae (Entomology)	88	3, 000
59 Effect of climatic conditions on the blooming and ripening dates of fruit trees (Pomology)	40	3, 000
60 The linkage of certain aleurone and endosperm factors in maize and their relation to other linkage groups (Plant Breeding)	55	3, 600
Total	<u>1,454</u>	<u>81,500</u>

	Number of pages in printed publication	Number of copies printed
EXPERIMENT STATION BULLETINS:		
283 (Reprint) The control of insect pests and plant diseases (Entomology and Plant Pathology).....	47	10,000
404 Working plan for a communal forest for the town of Ithaca, New York (Forestry).....	49	10,000
405 An economic study of farm tractors in New York (Agricultural Economics and Farm Management)....	84	15,000
406 Decomposition of green manures at different stages of growth (Agronomy)	35	5,000
407 The painted hickory borer (Entomology).....	33	5,000
408 Production of new strains of corn for New York (Plant Breeding)	64	5,000
409 An economic study of dairying on 149 farms in Broome County, New York (Agricultural Economics and Farm Management)	175	6,000
410 Studies on insects affecting the fruit of the apple, with particular reference to the characteristics of the re- sulting scars (Entomology)	54	5,000
Total.....	<u>541</u>	<u>61,000</u>

READING-COURSE LESSONS FOR THE FARM:

98 (Reprint) Practical examples in dairy arithmetic (Dairy Industry)	24	3,000
102 (Reprint) Cooling milk (Dairy Industry).....	20	3,000
106 (Reprint) Spring in the flower garden (Floriculture)...	24	3,000
119 (Reprint) The curing of meat and meat products on the farm (Animal Husbandry)	20	2,000
121 (Reprint) The culture of garden roses (Floriculture)..	28	3,000
123 (Reprint) Top-working and bridge-grafting fruit trees (Pomology)	28	3,000
125 (Reprint) Orchard soil management (Pomology).....	20	2,000
128 (Reprint) Autumn in the flower garden (Floriculture).	36	3,000
130 (Reprint) Rearing chickens; brooder house construction (Poultry Husbandry)	32	5,000
133 (Reprint) Preparation of eggs for market (Poultry Husbandry)	40	5,000
140 (Reprint) The Babcock test, and testing problems (Dairy Industry)	32	3,000
159 Forest planting on the farm (Forestry).....	40	8,000
160 Harness repairing (Rural Engineering).....	43	25,000
161 Diseases interfering with reproduction in cattle (Col- lege of Veterinary Medicine).....	24	5,000
Total	<u>411</u>	<u>73,000</u>

READING-COURSE LESSONS FOR THE HOME:

135 (Reprint) Fireless and steam-pressure cookers (Home Economics)	43	10,000
136 (Reprint) Food preservation (Home Economics).....	86	15,000
137 (Reprint) The home laundry (Home Economics).....	46	5,000
138 (Reprint) Saving strength in the household (Home Economics)	20	5,000
139 Permanent gains from the food conservation movement (Home Economics)	12	20,000
Total	<u>207</u>	<u>55,000</u>

	Number of pages in printed publication	Number of copies printed
EXTENSION BULLETINS:		
21 (Reprint) How to select laying hens (Poultry Husbandry)	16	5,000
31 (Reprint) The European corn borer (Entomology)....	20	5,000
40 (Reprint) The preparation of marketable vinegar (Agricultural Chemistry)	14	2,000
44 Cider and its preservation (Agricultural Chemistry)...	24	12,000
45 Cornell poultry rations (Poultry Husbandry).....	8	15,000
46 Improving old pastures (Agronomy).....	20	21,000
47 List of popular publications (Extension Service).....	4	6,000
48 Sewage disposal for rural homes (Rural Engineering)..	28	7,500
49 Estimating the value of timber in the farm woodlot (Forestry)	28	4,000
50 The farm water supply. Part I. Simple water systems and plumbing (Rural Engineering).....	75	10,000
51 Separation of cream (Dairy Industry).....	19	4,000
52 Improving the school building facilities of one- and two-teacher districts through measurement (Rural Education)	20	8,000
53 Plays for the country theatre (Rural Social Organization)	72	8,000
54 The historical pageant in the rural community (Rural Social Organization)	28	8,000
55 How to plan the farm layout (Rural Engineering).....	36	8,000
Total	412	123,500

JUNIOR EXTENSION BULLETINS:

6 (Reprint) Potato growing for boys and girls (Vegetable Gardening)	20	8,000
9 Poultry keeping for boys and girls (Poultry Husbandry).....	16	13,000
Total	36	21,000

RURAL SCHOOL LEAFLETS:

September, 1921 (Rural Education).....	180	30,000
November, 1921 (Rural Education).....	64	100,000
January, 1922 (Rural Education).....	56	125,000
March, 1922 (Rural Education).....	64	100,000
Total	364	355,000

MISCELLANEOUS:

Program for fifteenth annual Farmers' Week, February 13-18, 1922.....	32	12,000
Farmers' Field Days at Cornell	16	6,000
Total	48	18,000

ANNUAL REPORT FOR 1921	102	3,500
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ANNOUNCEMENTS:

Announcement for summer term, 1922.....	22	2,500
Announcement of courses, 1922-23.....	103	15,000
Announcement of winter courses, 1922-23.....	42	10,000
Total	167	27,500

SUMMARY

	Total number*	Total pages	Copies
Memoirs.....	21	1,454	81,500
Experiment station bulletins.....	8	541	61,000
Reading-course lessons for the farm.....	14	411	73,000
Reading-course lessons for the home.....	5	207	55,000
Extension bulletins.....	15	412	123,500
Junior extension bulletins.....	2	36	21,000
Rural school leaflets.....	4	364	355,000
Miscellaneous.....	2	48	18,000
Annual report.....	1	102	3,500
Announcements.....	3	167	27,500
	75	3,742	819,000

*Including reprints.

Farmers Week

The fifteenth annual Farmers Week, held February 13 to 18, was considered by many to have been the most interesting and most successful of all the Farmers Weeks held, in spite of the fact that the registered attendance of 3830 was slightly less than that of 1921, when the high-water mark of 4116 was reached. The arrival of many persons on Sunday and early Monday morning and the large registration on Monday (781), together with a larger attendance than normal at the lectures on Friday afternoon and at the Eastman Stage on Friday evening, indicated that the people remained for longer periods than usual. The speakers report unusually good audiences, not only in size but also in their interest and their desire to get definite facts. The lectures on economics were especially well attended, as were those on horticulture, fruit growing, and many other more technical subjects.

The exhibits this year were very much improved over previous exhibits. They attracted a great deal of attention and favorable comment was heard from several sources. The exhibits in poultry and rural engineering, and the government exhibit on marketing, were especially noteworthy.

One or two specially cultural features were provided. Professor M. W. Sampson, of the College of Arts and Sciences, gave a few readings that were very much enjoyed by his large audience, and Mrs. Comstock gave an illustrated lecture on a walk through William Tell's country in Switzerland. Similar features should be included to a greater degree next year.

The number of events scheduled on the program amounted to 520, which was 18 more than for any previous year. This increase was largely due to an increase in demonstrations and round tables, which numbered 111 as compared to 77 last year. There was a reduction in the number of lectures, the total being 273 as compared with 293 in 1921, 305 in 1914, and 326 in 1912. The list of events for 1922 was as follows: lectures, 273; demonstrations and round tables, 111; contests (speaking and judging), 10; practice periods, 34; conventions, 8; exhibits, 52; banquets, concerts, and motion pictures, 32. It is also interesting to note that there were fewer outside speakers this year than in any year since 1913, with the exception of 1917; the total number this year was 52, or 20 less than last year.

The yearly data for Farmers Week from its beginning to the present time are given in the accompanying table.

GROWTH OF FARMERS' WEEK

Year	Attendance		Lectures	Demonstrations and round tables	Contests (speaking and judging)	Laboratory courses and practice periods	Conventions and conferences	Exhibits by departments	Entertainments (banquets, concerts, motion pictures)	Cooperating lecturers	Total events
	Registered	Estimated									
1908.....	.....	800	76	9	1	.....	4	8	1	.....	99
1909.....	.....	2,000	124	18	5	1	5	14	1	.....	168
1910.....	.....	2,100	156	20	6	6	6	9	2	.....	205
1911.....	1,632	2,500	295	20	3	3	11	12	2	.....	346
1912.....	2,025	2,700	326	34	4	3	9	16	3	.....	395
1913.....	2,409	3,100	284	10	10	16	17	16	3	.....	356
1914.....	2,961	3,500	305	27	11	33	19	14	7	82	416
1915.....	3,077	4,100	269	26	17	36	16	20	15	65	399
1916.....	3,548	4,500	256	35	11	38	10	19	12	61	381
1917.....	3,611	4,500	281	51	8	33	12	17	18	46	420
1918.....	3,095	4,000	293	33	12	32	12	20	12	63	414
1919.....	3,763	4,500	271	60	8	5	9	18	11	57	382
1920.....	2,654	3,200	243	105	10	32	9	20	11	74	430
1921.....	4,116	5,000	293	77	8	56	15	40	13	72	502
1922.....	3,830	4,500	273	111	10	34	8	52	32	52	520

Farmers Field Days

Following the recommendations of the committee of last year that the Farmers Field Days of 1922 be cut to two days instead of three, the Third Annual Field Days were held on June 22 and 23. Unfortunate weather conditions, consisting of unusually severe windstorms and cloud-bursts in several sections the two days previous, which resulted in blocked railroads and highways from washouts, and the continuous rain during the first day and up to late in the forenoon of the second day, prevented large numbers from attending. However, there were some who would not be daunted by these conditions, and the attendance the first day was estimated at 450 persons, many of them driving in from long distances. The clearing weather of the second day brought a larger attendance and it is estimated that 650 were present on that day. No registration was taken except for the juniors, of whom there were 161 present from 17 counties.

The committee in charge of the program this year determined to stress the picnic idea. The program was planned with this in view. The forenoon of each day was devoted to tours about the campus and the university farms, organized with a definite route and stops, and with guides to point out and explain the things to be observed. The noon hour was kept free for the picnic lunch in the Drill Hall. After lunch a brief "community sing" and organ recital was held in Bailey Hall. The only indoor lectures provided on the program were an address by President Farrand on the first day and an address by Dean Mann on the second day.

One entertainment feature of the program which proved of great interest was the horseshoe-pitching tournament. This was thrown open as a state-wide contest, with regular team entries, and the prize offered was a silver loving cup. Twenty-two teams entered the contest for this cup. The contest was started on Thursday and finished on Friday, with the team composed of King and McCurdy, representing the college faculty, emerging as winners. Mr. G. E. Snyder, individual state champion and Vice President of the National Association of Horseshoe Pitchers, acted as general referee for the contest.

For the first time a special program was provided for the juniors especially fitting in with the junior-project work. Others than regularly enrolled junior-project workers, however, were admitted. This program consisted of demonstrations in poultry, animal husbandry, garden and field crops, and homemaking. Special trips about the campus and the buildings were arranged for juniors, and on Thursday evening a camp fire and wiener roast was planned. On account of the rain the camp fire was given up, but the remainder of the evening program was carried out in the Drill Hall. The University was host to the juniors, and provided rooms, without charge, in the university dormitories. Those who were in touch with this junior program endorse the idea very highly and recommend its continuance on a larger scale next year.

State Fair, 1921

The college exhibits at the State Fair at Syracuse were, in general, similar to previous exhibits although different phases of subject matter were stressed and an endeavor was made to put more life into the exhibits

and to make them more attractive. The departments having exhibits in the State Institutions Building were Rural Engineering, Forestry, Plant Breeding, Poultry Husbandry, Dairy Industry, Landscape Art, Rural Social Organization, Rural Education, and Extension. The College of Veterinary Medicine also had its exhibit in this building.

The College made many other contributions to the State Fair. The Department of Dairy Industry, in cooperation with the State Department of Farms and Markets, maintained its demonstrations of making butter and ice cream in the Dairy Building, and of carrying on the dairy testing work. The Department of Floriculture maintained a booth in connection with the floricultural display in the Manufactures and Liberal Arts Building. Cooperation with the Indian exhibits through Dr. Bates was maintained, and the taking charge of and handling the junior-project workers' exhibits and demonstrations by the Office of State Leader of Junior Project Workers was an important part of the fair work.

Mention should be made of the country theater, which was conducted, as previously, by Professor Drummond and assistants. A slight change was made in the building, making it somewhat more desirable by shutting out some of the noise from the near-by railroad. Capacity audiences were played to every day, and in many cases the doors had to be closed some time before the plays began. Although admission to these plays has been free in the past, the question of making a small charge is being considered for next year.

Town and county fairs, 1921

In so far as facilities would permit, the College continued in 1921 to render assistance to town and county fair associations. Practically all the work done by the extension representatives of the College was demonstrational judging—that is, judging of exhibit classes so as to interest and instruct both exhibitors and spectators. This can be accomplished only when ample time and space are allowed for the judge to point out and explain to all the reasons for the placings.

In addition to the demonstrational judging of regular entries, specialists from the College assisted, in person or by correspondence, the several county agricultural agents with the exhibits of the local farm bureau. In a few instances assistance was rendered to the fair officials in the presentation of pageants or amateur dramatic productions.

Exhibits unaccompanied by a specialist were prepared and sent out by only two departments. An exhibit of "School Grades" and one of "Injurious Insects" were used at four fairs. The poultry specialists accompanied an exhibit to several fairs.

The specialists spent a total of 92 days at town and county fairs. This work reached 32 fairs in 28 counties. No record was kept of the number of individuals reached through exhibits, nor was it possible in many instances to estimate the number of individuals reached through the judging demonstrations.

Reports on 47 of the man-days spent in demonstrational judging show 53 demonstrations with a total attendance of 3434; the largest single attendance was 125 and the smallest was 25.

Extension mail

From July 1, 1921, to June 30, 1922, a total of 24,610 letters were received by the Extension Office; 15,156 of these were general and were answered directly, and 9454 were referred to departments. These letters required a total of 29,814 replies. This is exclusive of all mail received by subject-matter departments or specialists.

Extension Service handbook

The first handbook, or reasonably complete compendium, of useful information attempted by the College was organized under the direction of E. A. Flansburgh, Assistant County Agent Leader, and 500 copies were distributed to extension officers, specialists, county agents, teachers, cooperators, and others. The specialists in each department prepared the copy.

Extension schools

As pointed out elsewhere in this report, extension schools were first held in New York in 1894. For five or six years the number of schools increased. Then followed a total lapse until the winter of 1910-11, when they were revived. Use of this method then expanded fairly rapidly until 1915-16, fell off markedly during the war years, and since 1919 has come back almost as rapidly as it declined, until in 1921-22 there were held 67 schools in agriculture, the largest number ever held in a single year.

The school represents the most ambitious educational effort in extension. From the earliest trials the aim has been not so much to present predigested facts of immediate practical application or rule-of-thumb suggestions, as to teach fundamental principles to stimulate the power of observation and to help develop a habit of thinking a problem through. A schoolroom setting, with blackboard, notebooks, microscopes, plant and animal specimens, or other accessories to individual student participation in "laboratory exercises," has characterized the school work.

The weakness of the school methods is in the comparative heavy expense of operation. In this respect the school lies midway between the individual farm visit — perhaps the most effective single means of carrying on extension work — and the demonstration or lecture. The objection of cost has been partly met through increasing income from fees, careful routing of specialists, reduction in overhead expense, and the number of instructors per school, the last-named being an incidental advantage of the more highly specialized schools. Specifically, the cost to the College per student, exclusive of salaries and overhead expense, has dropped from well over \$1 to 58 cents in 1921-22.

Programs. Programs of the first schools were board and varied in scope. In this respect they were more in the nature of sublimated institutes or Chautauquas than of schools. While the methods employed were scholastic, the subject matter was rather a well-chosen collection of samples than a fairly complete course in a single narrow phase or aspect of a subject. There was no well-defined local program for progressive development to tie to.

Gradually the schools have become more highly specialized, narrowing down to a single subject and finding a definite place in a well-charted plan of community development. From "farm schools" they became "dairy,"

“poultry,” and fruit” schools, and then “milking-machine,” “culling,” and “spraying” schools.

The duration of the schools has varied from three weeks to three days, with five days tending to become the standard. Schools of less than three days have as yet been tried only in an experimental way. Some subjects, however, lend themselves readily to this treatment and will be taught in this way. Plans are now being developed for two-days sewing-machine schools and one-day accounting schools.

Schools in 1921-22. An interesting feature of the school season just passed was three county-wide schools. While these were not intended as a development of the local-leadership plan as it has been worked out with certain phases of home economics, they did serve the purpose of obtaining a wider spread of influence than can normally be expected of a community school and will be given further trial.

A tabular summary of the schools held during the winter of 1921-22 follows:

	1921-22	1920-21
Total number of schools held.....	67	59
Number of two-days schools.....	1	..
Number of three-days schools.....	34	50
Number of four-days schools.....	17	..
Number of five-days schools.....	15	9
Counties reached.....	28	29
Total enrollment.....	2,468 *	1,919
Average enrollment.....	36.83	32.52
Largest enrollment.....	84	59
Smallest enrollment.....	11	11
Highest percentage of attendance.....	98.55	96.36
Average attendance per session.....	27.41	22.98
Average number of instructors per school.....	2.04	2.06
Length of school season (weeks).....	17	17

* Computed on basis of school as unit; in departmental reports each session is considered as a unit.

Instruction was given by the various departments as follows:

	Number of days	Number of schools
Agricultural Economics and Farm Management.....	47	12
Agronomy	33	10
Animal Husbandry.....	36	11
Dairy Industry.....	25	8
Entomology	9	3
Plant Breeding.....	7	3
Plant Pathology.....	12	4
Pomology	18	6
Poultry Husbandry.....	59	12
Rural Engineering.....	234	28
Vegetable Gardening.....	4	2
Veterinary College.....	4	1

Lectures and demonstrations

On the average, extension specialists divide their time about equally between office and field work. Office work consists of answering letters of inquiry and other correspondence (which in some departments runs very heavy), analyzing materials sent in for examination, preparing reading courses, preparing bulletins, new articles, and other written matter, getting together lecture notes, demonstration materials, and other teach-

ing equipment, the tabulation and study of field data furnished by county agents, the development of plans and projects, attendance at staff meetings and conferences, preparation of reports, and the like.

Exclusive of the time used in travel, extension specialists on the average devote about 45 per cent of their time to field activities. The entire time given to this work is apportioned among the several principal methods employed in the field, as nearly as can be estimated, approximately as follows: extension schools, 10 per cent; lectures, 25 per cent; demonstrations, 20 per cent; conferences and conventions, 20 per cent; inspections, farm visits, and miscellaneous activities, 25 per cent. It should be emphasized that these divisions are averages and include rather wide variations as between the several departments.

Where the line of demarcation should be drawn between a demonstration and a lecture is not clear. As pointed out elsewhere in this report, all of this type of work, as far as possible, is so correlated with the long-term community and county programs as to tie up with other means and activities in forwarding the general improvement plans under way. In attempting to measure results, therefore, while the relative effectiveness of methods must be studied, the results either in terms of practices changed or in terms of larger returns either financially or in enjoyment, are not usually susceptible of direct correlation with any single educational effort. The lecture method, while open to much criticism as being wasteful of effort, still continues highly in demand; in fact, it exceeds in that respect all other means except the request for bulletins and other reading matter. The strength of this method as compared with that of reading material, of course, lies in the personal contact and the opportunity for stimulation to action.

Demonstrations and lectures are given mainly at the request of county agricultural, home demonstration, and club agents as a part of the cooperatively formulated county program of work. Many calls, however, are received from granges, farmers' clubs, Y. M. C. A.'s, church organizations, women's clubs, chambers of commerce, rotary clubs and similar commercial and manufacturing or trade organizations, schools and colleges, philanthropic organizations, and individuals representing unorganized groups. These requests are met so far as time and funds, and the demands of regular project work, permit.

During the fiscal year 1921-22 the total number of demonstrations given was 1834, attended by 56,724 persons; the number of lectures was 1658, with a total attendance of 107,550. These figures, of course, do not include similar work done by the county agents where college specialists were not employed.

Farm and home institutes

Since the farmers' institutes were turned over to the College in 1918, considerable progress has been made in correlating this type of meeting with the county programs. One important factor in the accomplishment of this end has been the close relationship established between the special institute workers and the subject-matter departments, through each of these seasonal employees being pro tempore a member of the department in which his field of work lies rather than merely a temporary adjunct of the central administration office.

At the same time an effort has been made to retain the inspirational spirit and encouragement and sound practical advice which has characterized the institutes for many years and which has won for them a place in the hearts and minds of many farmers which no other meeting quite fills. In so far as the institutes have held their old prestige while also keeping abreast of rapid developments in organization and in scientific knowledge, credit is due chiefly to D. P. Witter, whose services in this connection the College has fortunately been able to retain.

During the winter of 1921-22 there were conducted 262 farm and home institutes in 35 counties, making 23,415 contacts at 506 men's sessions and 8048 at 227 women's sessions, or a total of 31,463 contacts.

Special departmental activities

Agricultural Chemistry

There were received in the laboratory of the Department of Agricultural Chemistry, the past year, 150 samples of miscellaneous agricultural products — vinegar, water, fertilizers, feeds, limestone, and others — which were analyzed and for which reports were made to the persons sending them. Some of these samples came from county agents, grangers, and individual farmers. This number is somewhat less than formerly, owing to the fact that soil samples are now referred to the Department of Agronomy.

Correspondence concerning samples analyzed and answering questions submitted by farmers amounted to about 700 letters.

Agricultural Economics and Farm Management

During the past year there has been a considerable increase in the amount of systematic extension work carried on by the Department of Agricultural Economics and Farm Management. Members of this department taught in 11 extension schools with an aggregate attendance of 2324, held 25 farm demonstrations attended by 442 persons, and gave 86 lectures at community meetings and other single-session meetings with an attendance of 5439; seven days were spent in farmers' institute work with an attendance of 522; 71 farm inspections and visits were made; and 64 conferences were held with representatives of cooperative associations, business organizations, and others, attended by 775 persons; making a total of 9573 personal contacts.

The Advanced Farm Management Reading Course, which was started in February, 1921, now has an enrollment of 48. Nearly all of the persons enrolled in this course are practical farmers managing their own farms and working out their own farm problems in connection with the practical exercises given in the course.

A special farm-management service was organized for farmers in Genesee County. Nine farmers paid \$10 dollars each for this special service. The department made a survey and a map of each farm, and a study of the business organization and of the building arrangements of each farm. Suggestions for changes in the business organization, rearrangement of the farm layout, and changes in building arrangement, were sent to each farmer as a result of these studies. This work will be continued in Genesee County for another year. The intention is to demonstrate the value of such service.

Complete sets of cost accounts on farms, which have been carried on for about eleven years, were continued during the year 1921-22. Forty-four new accounts were started and thirty-five accounts were closed. The accounts for the previous year were summarized, detailed studies were made, and the results of the studies were returned to the cooperating farmers.

During the year, 728 inventory books, 1033 cashbooks, and 1392 account books, were distributed to farmers at cost. Instruction in farm accounting was given at the five-days extension schools and at some special one-day farm-account schools.

In addition to bulletins prepared, a regular news service in agricultural economics and farm management has been organized and is sent monthly to the *Farm Bureau News* and the local newspapers of the several counties. Special articles on prices and agricultural conditions have been furnished to the *Extension Service News*.

About fifteen special news articles have been furnished to the agricultural papers and other periodicals.

Agronomy

The extension program of the Department of Agronomy is the result of the amalgamation of the extension activities dealing with crop production and previously handled by the Department of Farm Crops, with those having to do with soil improvement and utilization which in the past comprised the extension work of the Department of Soil Technology. This reorganization has necessitated some readjustment in the details of the extension work, but the program followed during the year is virtually a combination of the two departmental programs, which have very much in common so far as the work has fallen within the scope of the Department of Agronomy.

In the formulation of the extension work having to do with both soils and field-crop production, attention has been given to the development of a balanced and well-rounded program. The work has been conducted under the following twelve main subprojects: lime, fertilizers, farm manure, organic matter and green manure, soil tillage and cultivation, soil improvement through crop rotation, pasture improvement, silage-crop production, alfalfa production, forage-crop production, small-grain production, weed eradication.

Summary of activities. The field work of the specialists for the year may be summarized briefly as follows: days in field, 420; lectures given 159, attendance 7289; conferences and conventions attended 88, attendance 975; field inspections, demonstrations, and farm visits, 445; extension schools attended 10, attendance 2512 (cumulative by sessions); demonstration meetings 24, attendance 1213.

The following publications have been prepared during the year: leaflets published, *Fertilizing Crop Rotations*, *Utilizing Farm Manure*, *Liming New York Soils*; ready for publication, *Soil Organic Matter*. In addition, more than eighty articles, including the regular soil and crops-notes service, have been prepared for the farm bureau news of different counties and the general news service.

The scope of office activity is indicated by the following summary of work: soil samples examined, 360; circular letters written 27, circulation 1704; letters in regular correspondence, 3871; articles, 81.

Results. While there are no means of accurately measuring the results of the work conducted, it is clearly evident that fertilizer and cropping practices are being influenced. For example, the home mixing of fertilizers has increased in the sections where the practice has been advocated, while through the dairy sections of the State acid phosphate is being more universally used, with a corresponding reduction in the tonnage of low-analysis mixed fertilizer.

While the amount of lime used in the State is still below pre-war records, it is well above last year's tonnage. Assistance has been given in the securing of reasonable freight rates, in the development of local sources of limestone, and in the supplying of information as to the comparative value of the different forms of commercial lime available for the treatment of soils.

The campaign for the more efficient utilization of farm manure has been continued, with noticeable results in a fuller appreciation of the fertilizer value of this valuable farm by-product.

Results from the activities in connection with pasture improvement are discernible throughout the State. More interest is being manifested in rotation pastures in the better agricultural sections. While the extensive seeding of annual sweet clover has been discouraged, the use of the biennial variety, especially for pasture purposes, has been encouraged on the limestone soils of the State. In practically every county, encouraging results of the alfalfa, clover, and other forage-crop production work may be seen. The acreage of small-grain mixtures, particularly of oats and barley, appears to be far greater than in any previous season, while supplementary silage crops are being grown more extensively in the sections to which they are best adapted.

While there are numerous agencies lending their influence to better cropping systems and more efficient soil management, the extension activities of the Department of Agronomy have played their part in the progress made the past year.

Animal Husbandry

The extension work in animal husbandry for the past year has been done by four specialists. The untimely death of Professor Charles H. Royce in August, 1921, at the beginning of this year, has been keenly felt, and the difficulty of promptly finding a successor has appreciably limited the contacts of the department. There has been an increased demand for service, which has been met as far as possible. The vacant extension position was filled on June 1, 1922, by the appointment of W. T. Crandall as Assistant Extension Professor of Animal Husbandry.

Demonstrations on farms are the most popular form of meeting, because of the appeal of familiar surroundings and the presence of concrete illustrative material. Similarly, demonstrational judging at fairs, which serves as an encouragement to the small breeder, is in growing demand.

In order to give definite direction to animal-husbandry extension work in the several counties, a special livestock committee is being tried. This is composed of responsible livestock growers, the selection being such as to represent all the livestock problems in the county. The specialist meets with the committee two or three times each year to decide upon the work to be done and a program for doing it. It is felt that this plan will prevent scattering efforts, and, by fixing personal responsibility, will make itself felt in the respective communities. The plan should also help to secure a wider spread of influence for the work.

Activities for the year are indicated in the following summarization of some of them: 179 demonstrations attended by 5479 persons; 235 lectures attended by 9172 persons; 98 conferences and conventions with 703 persons; 438 inspections and farm visits; 11 extension schools with an attendance of 1520 (cumulative by sessions); 7 exhibits; 140 farm and home institutes with 10,767 attending; making a total of 28,079 contacts through 660 days in the field. In addition there were 37 articles written, 21 circular letters sent to 1219 persons, and 2159 personal letters written in reply to inquiries.

Accomplishments. The following statement indicates in a meager way some of the results accomplished as gleaned from reports of county agents, the agency with which the specialists cooperate most fully. These reports indicate 25 dairy-improvement associations as of July 1, 1921, and 31 associations on June 15, 1922. Eight associations were discontinued during the year, and fourteen new ones were organized. Nine counties are using monthly milk-record sheets. Twenty-three counties made a sire survey. There were 107 purebred sires placed during the year, 17 calf clubs formed by county agents, and 5 community bull associations formed.

Dairy-improvement work. The supervisor of dairy-improvement associations assists in organizing associations, gives information to county agents and others interested, and supervises the work of the testers in these associations. This involves correspondence with county agents, testers, applicants, officers of the associations, and others, giving lectures, holding demonstrations, making farm visits, and making a summary of each herdbook, a copy of which is sent to the county agent and another to the owner of the herd. All of the summaries are classified and averaged for each association and for all the associations together. The production and cost figures thus obtained are available for the county farm bureau news and for use of the extension service generally. Each month a news letter containing reports of the associations is sent to all concerned in the work.

The greatest benefit from dairy-improvement-association work is obtained by those members who study their herdbooks and follow the records closely month by month. The dairy-improvement association acts as a strong incentive toward better dairying methods. The members compare notes and learn from one another and from the tester what brings the largest returns.

As a result of association records, the low producers are gradually replaced by better grades and these in turn by purebreds. The develop-

ment and improvement of many herds is largely attributed to the better care and feeding of the animals while cow-testing-association work is being done. Official testing follows closely after the association records.

In reorganizing associations after one or more years of work, it is very noticeable that the owners of the highest-producing herds are invariably the men most interested in continuing the testing. Those whose herds are toward the bottom of the list can see no benefit from the records. How to reach this class is a problem to be studied.

Ration service. The effectiveness of certain forms of the monthly ration service can hardly be expressed in measurable terms. The service has a broad distribution and is widely used. Undoubtedly many feeders change their practices as a result. This is true also as regards the persons attending local demonstrations, schools, and lectures scheduled by the county agents for the specialists. A large proportion of the requests for information, both by correspondence and in the field, are on feeding questions. As yet, this is perhaps the best answer to the effectiveness of the work.

Correspondence courses. During the year two correspondence courses in animal husbandry have been outlined and offered to the public through the office of the supervisor of the reading course. One course was on milk production, the other on animal breeding. The students read assigned texts and indicate their progress by answering a series of questions and completing certain other exercises within the span of a year. Thus far the interest in the courses and the reaction to the lessons sent out have been satisfactory. Twenty-six persons were enrolled on June 30, 1922.

Accredited herds. Interest in accredited-herd work showed striking gains during the past year. This was due to a number of factors— attractive indemnities, better veterinary service, and the formation of county associations to promote the work. There were formed, in all, ten county associations of cattle owners to do work more or less on the area basis. These associations established mutual regulations for working locally, and had definite understandings with supervising state and federal authorities. The applications for tests were so numerous, however, that available funds for indemnities were soon exhausted. Emergency appropriations were made, but progress has been greatly hampered.

Mention is made of the county associations because they are likely to be the key to future work. Some points in their organization are yet to be cleared up. After arranging an understanding with supervising agencies, they will work first for clean herds, then for clean areas. In the ten counties mentioned, 46,154 cows were given the first test and 17.7 per cent reacted. The percentage of reaction reported ranges from 3.6 in Allegany County to 39 in Chenango County.

Sheep. Following a pronounced depression in the wool business, a slow revival is under way, with a consequent renewed call for meetings and demonstrations in sheep husbandry. The quickened interest is due largely to the success of the state wool pool, in which 36 counties pooled 456,673 pounds of wool. In some cases, from eight to ten cents a pound more than local buyers had offered was obtained by this means.

Records of an approved form are being kept in 25 flocks in four counties. This work serves, first, as a local demonstration on methods of management. The sheep specialist makes three farm visits each year for personal observation and to check records. The first results from these observations will not be available until next fall. They will be of great value in furthering the work.

Demonstrations in the selection of rams, the culling of ewes before breeding, and the docking and castrating of lambs, were held to the number of 41, attended by 661 persons. There were also 3 lectures given, attended by 120 persons; 6 conferences, with 125 persons; 82 inspections and farm visits; 11 articles written; circular letters sent to 85 persons; and 209 personal letters written. The sheep specialist spent 102 days in the field.

Botany

About 10,000 inoculation cultures for leguminous crops have been sent out by the Department of Botany, and about 1,000 letters written in connection with this work. Approximately 200 weed- and plant-identification letters, and 350 miscellaneous queries, have been received and answered. A demonstration and a lecture on legume inoculation were given in Farmers Week.

Dairy Industry

Because of the vital relationship between quality and markets, the most important project in dairy extension is to improve the quality of milk and its manufactured products. The question is complex in the extreme. Both because of the size of the field and because of its numerous ramifications, it is difficult to outline programs of procedure that are sufficiently comprehensive to include all phases.

Research needed. One handicap that embarrasses any attempt to outline programs for the improvement of quality in milk, whether for manufacturing purposes or for fluid consumption, is the lack of definite knowledge regarding numerous problems. For example, no one knows whether or not the present grades of "A," "B," and "C" are fair. Methods employed to insure quality, city milk ordinances, the applicability of bacteria counts, barn scores, and compulsory pasteurization, need investigation. There should be a standardization of the kinds of information dispensed by inspectors, in order to eliminate, so far as possible, the dispensing of misinformation. The following are some of the questions not yet satisfactorily answered: What are the essential factors necessary for the production of high-grade milk? To what extent does shipping milk on automobile trucks or in un-iced railroad cars, especially during warm weather, influence the bacteria content?

Many other problems could be raised, but these are sufficient to emphasize the fact that what is needed more than anything else is research.

Procedure. Extension activities of the Department of Dairy Industry during the past year have centered primarily on carrying to the dairy-men information regarding the essentials for the production of high-grade milk, and to the plant operators information related to plant operation.

The aim is to assist the dairyman to consistently produce a dependably high-grade milk by demonstrating the relationship between the bacteria content of milk and its quality, the factors that determine the source and growth of bacteria, and other factors that are related to quality. The fact that many dairymen in New York are compelled to meet bacteria-count requirements creates the situation which makes possible the carrying of this information directly to the producers. A procedure found effective is to grade on consecutive days the milk delivered by each patron to any given plant, and follow this grading with a discussion of the results at a meeting of the patrons. The interest is invariably keen, especially in cases in which a city board of health has threatened to exclude the milk because of poor quality.

For example, a milk-shipping station in Oswego County had been forbidden to sell milk to New York City because of too high bacteria counts. A preliminary grading revealed 39 per cent of the milk to be "poor" in quality. Two meetings were held and personal visits were made to 23 farms. As a result the amount of "poor" milk dropped to 4.7 per cent. This same plant forthwith engaged a young man to continue the grading under supervision from the College, and, as a result, at no time since has more than 10 per cent of "poor" milk been delivered, while the amount of "poor" milk has averaged 7.9 per cent since the plant continued the follow-up work.

At a similar milk plant in St. Lawrence County, where the first project of this character was tried, 15.8 per cent of the milk was "poor" in quality. This was lowered to 6.2 per cent. One year later there was still being delivered less than 8 per cent of "poor" milk. Part of this 8 per cent was delivered by new patrons taken on since the first grading was done.

One person in the department, assigned to half time in extension, works almost exclusively with butter and cheese factories and ice-cream and other dairy manufacturing concerns. By means of personal visits to the factories, assistance is given in the solution of many problems of processing, emphasis being placed on raising the quality of production.

Some work has also been done in cities, in assisting to work out reasonable bacterial standards and methods of control. In one city arrangements have been made to grade milk as it arrives at the city plant after shipment from a radius of from 10 to 65 miles. More than 40 per cent of this milk was "poor" in quality, but through correspondence and personal interviews with the inspector this has dropped to about 20 per cent. Still further progress may be expected, though a different problem is found here from what is found at a country fluid-milk plant.

At milk plants throughout the State in the past two years, 5243 samples have been analyzed, 2000 of which were analyzed during the year from July 1, 1921, to June 30, 1922. So far as it has been possible to check up at twelve plants, the amount of "poor" milk has been reduced from an average of 30 per cent to 12 per cent.

Summary of field activities. During the year, 276 days were spent in the field; 74 demonstrations were held, attended by 3881 persons; 41 lectures were given, attended by 1948 persons; 215 conferences were

held, with an attendance of 1363; 123 inspections were made; 8 schools were held, attended by 950 persons; and 8 farmers' institutes were held, with an attendance of 523. This makes the total of contacts 8788.

Entomology

The work under the entomology project was divided into three parts: (1) Control of injurious insects; (2) Beekeeping; (3) Control of birds and mammals.

Control of injurious insects. A large part of the demonstration work in the control of injurious insects is still done by means of special field assistants located in the principal fruit- and vegetable-growing counties. In the season of 1922, field assistants were stationed in nine counties. The work is conducted in cooperation with the Department of Plant Pathology, and the field assistants have charge of all demonstration work in insect and disease control conducted in their respective counties. This plan enables the college staff to reach a much greater number of growers than would otherwise be possible, and provides opportunity to teach the best system of protecting the crop from all insects and diseases throughout the year. The object of the work is not so much to change the grower's practice as to aid him in perfecting his present system to a higher point of efficiency and economy. In fact, much effort is required in many cases to keep him from changing in the wrong direction.

Each of the special field assistants in the fruit-growing counties conducts a spray service in which the United States Weather Bureau cooperates by furnishing special weather forecasts during the spray season. The field assistant is constantly in the field and is in close touch with orchard conditions. With this knowledge at hand he issues timely warnings to the growers, indicating the best time for the application of each spray. The weather is an important factor in spraying and the forecasts are often of great use in determining when the spray should be advised. For example, during the current season a rainy period occurred from May 18 to May 21, at the time of the calyx-spray application. The Weather Bureau predicted the storm on May 16. Warnings were broadcast by means of a telephone relay, enabling many growers to make at least part of their application ahead of the rain. At the time of the first summer spray, applied early in June, rain was forecast three days in advance. Because of this forecast, the warning to spray for scab control was sent out earlier than it would have been otherwise. Those who heeded this warning had almost 100-per-cent control of scab, while those who did not spray until after the rain had a rather severe infestation.

Carefully measured results in some counties indicate that the difference in scab control between orchards that used the spray service and those that did not, and also in comparison with check trees in criterion orchards, has been from 3 to 18 per cent. This means a saving to growers running into large figures, depending, of course, on the price that the crop brings.

In addition to conducting the spray service, the field assistants conduct seasonal spraying demonstrations in selected orchards in which the spraying is done according to the recommendations sent out by the

spray service. These orchards show the benefit of following the spraying schedule advised in the spray service in comparison with those treated separately.

Much time, both in the field and in the office, is required to supervise the work of the field assistants. A special field-assistant school of one week is held in March. An attempt is made to keep in very close touch with the work of these men, and to give them assistance and information as quickly as possible when they need it.

In order to have definite information as to the prevalence of the hessian fly, a survey is made of the wheat-producing counties just before harvest to determine the percentage of infestation as a basis for recommendations as to sowing after the fly-free date. The results of this survey are sent to the county agents in time for publication in the *Farm Bureau News* before sowing time. The result has been that a much greater number of farmers sow after the fly-free date than would otherwise be the case.

Through cooperation with the insect-pest survey conducted by the United States Bureau of Entomology, conditions in adjoining States sometimes give warning of outbreaks here. The record of previous years also is valuable as a basis for planning work in different parts of the State.

Exhibit material (charts and specimens) have been lent to several county agents for use in their exhibits at local fairs.

Beekeeping. From July 1 to November 30, 1921, the seasonal subjects of fall management of the apiary and the wintering of bees were given special stress by both lecture and demonstration. The fall meetings of the beekeepers' associations were visited and addressed. During this period there were 21 demonstrations given, with an attendance of 380; 13 lectures given, attended by 533 persons; 28 conferences held and conventions visited, with 951 present; and 32 apiaries visited; making a total of 1896 personal contacts.

In early August a questionnaire was sent out to all secretaries of beekeepers' associations to obtain information regarding the business done by the associations, the number of members, and so forth; to learn the attitude of the members regarding research, education, and extension work in beekeeping; and to get suggestions as to how the extension service might be made better and how the associations might do better work. Of the thirty replies received, twenty-seven emphasized education, research, and investigation as the most important beekeeping needs. All the replies heartily endorsed the extension work and expressed a desire to have more of it. Eleven favored cooperative buying and selling. Two new associations were organized. The total membership of all associations in the State is now over 1500, or more than five times the number when extension work in beekeeping was started four years ago.

Mr. Rea resigned on November 30, 1921, to accept the position of Extension Apiarist in Pennsylvania at a higher salary. R. B. Willson, formerly Extension Specialist in Bee Culture at the Mississippi Agricultural and Mechanical College, was appointed to succeed Mr. Rea and

reported for duty on June 16, 1922. Mr. Willson's time up to July 1 was given to a study of the bee-keeping situation in New York and to organizing his office preparatory to a full schedule of field work for the summer.

During the period in which there was no specialist in apiculture here, Dr. E. F. Phillips, Chief of the Division of Bee Culture of the United States Bureau of Entomology, in addition to his many duties most generously consented to handle the college correspondence on beekeeping.

Control of birds and mammals. Extension work in ornithology and mammalogy was carried on during the past year by means of lectures illustrated with lantern slides or motion pictures, by demonstrations, and through correspondence. A total of 24 extension lectures were given to audiences averaging about 400 for each lecture, and 8 demonstrations were given to an average attendance of about 70, making a total of 10,155 personal contacts. In addition, 300 letters were written in reply to inquiries chiefly about the control of destructive rodents and birds. Other items, however, which seem to be eliciting general interest, if it can be judged from the inquiries, are fur farming, game farming, the identification of birds, and methods of attracting birds.

The usual Farmers Week exhibit illustrating the relation of birds and mammals to agriculture was prepared and set up, and four lectures were given in the regular program. A series of articles on birds and bird study for teachers was continued in *Bird Lore*, the official organ of the National Association of Audubon Societies. A considerable number of new photographs of birds and animals were made, to be used in lecture work, and a new set of slides on methods of attracting birds was started. A written lecture will accompany the slides, which will be used for general distribution. The College now has what is considered the best collection of original photographs of birds in this country.

Forestry

The Department of Forestry has contributed materially, through furnishing information at meetings of sugar-bush owners and otherwise, to the organization of the Maple Producers Cooperative Association, Inc. It is expected that this will provide a means for more efficiently distributing a considerable proportion of New York's crop of maple sirup. The chief aim of the association will be to reach those markets — especially in the western part of the country, and in the high-class hotel and steamship trade — which have hitherto been largely closed to the individual producer. Some 200,000 gallons of high-grade sirup were marketed by the association this year at a fair price to the producer. If the work of this cooperative selling association proves as successful as its members and leaders hope, there should result a decided quickening of interest in the care and management of maple groves.

Plans for a junior project in forestry were accepted by the state leader of boys' and girls' work. It is hoped that parts of this project may be made effective during the coming year. At present the most fertile soil for the development of a junior project in forestry seems to be in Jefferson County, where there exists a combination of large wood-using industries, a leader of junior projects, and considerable areas of land which is best suited to forest production.

Four demonstration areas have been laid out in timber lots in Warren County. Figures obtained from measurements made on these lots indicate that white pine will attain merchantable size in fifty years and during that time will produce an average of 750 board feet, or three "markets," per acre per year. At \$4 per "market" for the logs, this is a return which rivals that from many agricultural crops.

One demonstration plot laid out in volunteer white pine in Delaware County indicates that similar results may be expected there.

The New York State Conservation Commission reports that 3,687,360 forest-tree seedlings and transplants were distributed for planting in the State during the past spring. The Department of Forestry here has no doubt assisted in awakening the people of the State to a realization of the need of forest plantings, through lectures, press notices, bulletins, letters, and personal interviews.

During the year there were 31 demonstrations held, attended by 188 persons; 31 lectures given, with an attendance of 2292; 59 conferences and conventions held, with 434 persons present; 51 inspections of woodlots made; and 8 days spent with exhibits; making a total of 2965 personal contacts in 27 counties. These activities represent a total of 114 days in the field. The number of acres of forest land known to be affected through this work is 1918. There were 2500 trees planted under the department's supervision. Office work includes 13 articles written, aggregating 27 pages; 6 circular letters sent to 1026 persons; and 1269 personal letters.

Home Economics

As indicated elsewhere in this report, extension work in home economics was begun in 1900 with the establishment of the reading courses for farmers' wives. Enrollment in these courses has grown steadily, and they have been enlarged until at present more than 26,000 women receive several publications each year. In addition 111 study clubs, with a membership of 3134, have been organized and definite study programs have been furnished them.

The work in home economics was organized into a Department of Home Economics in 1907. The present Home Economics Building was first occupied in 1913. With the addition of new personnel, equipment, and other resources, the extension program was materially enlarged. In 1915 the department reported that its extension work consisted "mainly in the publication of reading-course lessons for the farm home, and in the organization of Cornell study clubs, the preparation of programs for clubs, correspondence with farm women, work at farm home demonstration schools, and junior extension work in home economics in cooperation with the Department of Rural Education." The last-named line of work was begun in 1914. Gradually the department has utilized and applied practically all the methods used in agricultural extension, including lectures, demonstrations, schools, farm trains, Farmers Week, exhibits at fairs, and correspondence courses.

The establishment of home demonstration agents under the Smith-Lever Act and the development of the home bureaus as cooperating agencies, outlined elsewhere in this report, progressed rapidly during the war period, and these agencies began to function effectively as a means of

extending the home economics program about 1920. The home demonstration agents and the cooperating groups of women in the counties, together with the group of extension specialists in home economics added to the college staff in the past two or three years, have brought the greatest impetus to extension work in home economics that it has received at any time. The department now embraces several subject-matter units or divisions, such as foods and nutrition, institution management, textiles and clothing, housing and design, household management, which are practically departments in themselves. In all of these except institution management and housing and design, extension work is now conducted.

Local leadership. The Department of Home Economics, to a much greater extent than any other department in the College, has made use of a comparatively new method in extension teaching known as *local leadership*. The objects of the method are to develop self-reliance and initiative, and to reach a larger number of persons with more thorough training than would otherwise be possible with the limited number of specialists available. The method is based on the assumption, which has in large measure proved to be correct, that in every community there exist the intelligence and other qualities of leadership to solve its own problems, but that often these qualities require a stimulus to arouse them and direction to complete their functioning.

The procedure consists, first, in finding the local leaders, those persons who, through keen interest in the particular projects under discussion and by virtue of the position of respect and esteem which they command in the locality, are capable of influencing others. Usually this is done by election at a community meeting. The leaders chosen then meet at a convenient central point either for the county or for a district, as circumstances and the needs of the case require, to receive instruction in the project selected for study by the state or county project leader. This instruction is given, to the point where each local leader not only should be able to perform the particular task being studied, but also will sufficiently understand the fundamental principles involved to be able to cope with most of the questions and unexpected complications that will inevitably rise when the situation is reversed and the present student becomes preceptor in her own community. The local leader groups are met at sufficiently frequent intervals to keep the project moving by the addition of new lessons, to solve the problems which local leaders have found too difficult for their own solution, and to check up on the soundness of the teaching and on the results achieved.

The method seems to be highly satisfactory, particularly with those projects in which the fundamental principles involved are not too complicated and in which mistakes would not be too costly. Results indicate that the plan is feasible, at least with some projects, that women can be found willing and eager to cooperate in the service on a volunteer basis, and that the number of effective contacts for the specialist can be multiplied about tenfold. The reports on the nutrition and clothing projects which follow give further details of results.

The plan has many advantages aside from multiplying the effectiveness of the specialist. First of all, it stimulates and develops local initiative,

self-reliance, and leadership. It trains persons to think for themselves and to solve their own problems. It tends to quicken interest and increase responsiveness to the entire educational program. The objections to the method are in the main the objections to democracy in general. It may be dangerous. The wrong persons may be selected for local leaders—persons who through self-interest, or ignorance, or lack of loyalty to the state leader, or indifference, or a misguided sense of responsibility, or other unhappy attributes, may arouse neighborhood animosities or do other more serious damage. Moreover, even with all possible care both in the selection and in the training of leaders, the apparent necessity of limiting the local leaders strictly to the scope of material prepared by the project leader (specialist), especially in the case of projects concerned with human health, presents rather serious difficulties. Up to the present time, however, no serious consequences have resulted, and, while the method is still on trial, it holds much promise both in effectiveness and in range of adaptability.

Principal projects. The following projects have been developed in home economics extension during the year 1921-22: nutrition and food selection, from the point of view of both the adult and the child; food preservation and preparation, including the use of milk and milk products; clothing, including selection, construction, and care; hygiene and home sanitation; home management, especially the arrangement of the kitchen for efficiency and convenience; child training; civics and recreation. In organized counties the projects have been conducted almost exclusively through the home bureaus, and in other counties through local clubs or groups or farm bureaus.

The purpose has been to reach, as far as possible, all homemakers interested in improving home and community conditions; to disseminate home-economics subject-matter relating to the solution of the problems arising; to train women to become independent in the application of science and art principles to the solution of their problems; and to establish community enterprises which will further the aims of the projects.

The Associate State Leader in Charge of Programs, and the specialists from the College, have given assistance in the development of the programs in the counties and cities organized for extension service, by helping the home demonstration agents and the executive committees to study county needs and to plan programs based on those needs. The specialists have suggested methods of project organization and administration through which the programs have been effectively developed. They have assembled subject-matter material; have prepared programs; have presented subject matter to representatives from cooperating communities through whom the information was passed on to the organized project groups in their respective communities; have given lecture demonstrations in both organized and unorganized counties and in the cities; have supplied programs to clubs and study groups interested in home economics; and have answered innumerable requests for information from individuals.

One important and far-reaching feature of the year's work has been the establishment of cooperative relationships between the specialists from the College and representatives from commercial organizations and other

educational institutions. Successful results of this cooperation have been evident, particularly in the nutrition, foods, clothing, and home management projects.

The whole program this year has been more effective in achieving the aims of the extension service in home economics than have the programs of previous years. This is due in part to the fact that aims and methods have been more clearly defined and results more carefully analyzed.

Nutrition. The nutrition project has included the following activities: food-selection demonstrations conducted by the local-leader method in eight counties and one city; nutrition-health demonstrations with school children, conducted by college specialists, home demonstration agents, and local nurses in eleven counties; nutrition study classes conducted by specialists and home demonstration agents; "Feeding the Family" study course, conducted by correspondence with 50 study groups and 752 enrolled individuals.

The food-selection demonstration included home demonstrations on scoring the food selection of members of the family, and demonstrations in overweight, underweight, and constipation. A total of 110 communities cooperated in these demonstrations; 68 training meetings were conducted by the college specialists; 143 leaders were trained; the leaders held 422 project meetings, with an attendance of 4896; 343 families scored themselves on food selected; 2144 persons reported a change of 7321 practices in this regard, with definite results in better health on the part of 1174. Information on this subject has spread to more than 3000 persons and has resulted in the following community enterprises: school lunches; milk served in the schools; milk bars; supervision of the choice of menus for community dinners, picnics, and similar events; introduction of whole-wheat products and spinach into the local stores.

Thirteen nutrition-health demonstrations with school children were conducted in eleven counties. There were enrolled 305 children from 10 to 15 pounds under weight. The work was fostered by local home bureaus and parent-teachers' associations, in cooperation with home demonstration agents and specialists. Local cooperation was secured from parents, school authorities, physicians, dentists, and nurses. As a result of the work, the children improved in general health, gained in weight, changed their habits of food selection and of personal care and cleanliness, regulated their hours of sleep, and slept with windows open. Many were given needed dental and surgical care. Much improvement was noted in their appearance, in their general activity, and in their application at school.

The nutrition study classes were effective in arousing local interest, in improving local habits in food selection, and in stimulating a desire for further study.

Fifty study groups and 752 individuals, including 17 outside the State, were enrolled in the study course entitled *Feeding the Family*. Thirty-five per cent of the groups were active throughout the year and have reported enthusiastically on the results obtained.

Food preservation and preparation. The work developed in food preservation and preparation included milk campaigns conducted by the

college specialist in cooperation with local home bureaus in six counties; food preservation, conducted in six counties by the local-leader method; food preparation, carried on through lecture demonstrations by the college specialists in four counties; and the "fair" project, which is new this year and has been started in four counties. The "fair" project has been developed by the college specialists and the home demonstration agents in cooperation with county fair associations. The objects are to make food exhibits at the county fairs educational, instead of commercial as at present; to stimulate widespread interest in the food exhibits at fairs; to raise the standards of the food exhibited; to revise and standardize premium lists; to regulate entries; to make the judging of each exhibit an educational demonstration rather than merely the method of determining prize winners; and, as a result of this work, to raise the standards of food preservation and food preparation in the homes. The project has been carried out extensively in one county and is well started in the other three. The specialist in charge of the work in food preservation and preparation has visited 16 counties and given 64 lectures and 59 demonstrations, reaching a total of 11,156 persons, and 143 leaders have been trained.

Clothing. The clothing project has been developed in thirty counties and one city. The local-leader method of extension service, outlined briefly in the report for 1921, was employed exclusively in projecting the clothing program this year. Three counties were used by the college specialists as demonstration centers. Work in the other counties was in charge of county leaders (20 home demonstration agents, 1 volunteer leader, and 6 paid leaders) under the direction of the specialists.

Four subprojects — skirt design and construction, dress-form construction, preparation of the dress form for use, and use of the dress form including work on costume design, choice and alteration of pattern, and the application of this knowledge to the making of a perfectly fitting pattern — were developed. The aims of each subproject were to develop in each cooperator an appreciation of the fundamental principles involved in problems of selection and construction of garments, and to aid the workers to solve these problems successfully through work on garments embodying the typical problems met by every homemaker. There were 742 communities cooperating on one or more of the subprojects. Each community received assistance at from six to nine instruction meetings. A total of 1468 local leaders were trained; 160 training meetings were conducted by specialists, 367 by county leaders, and 2982 by local leaders in their respective communities, making a total of 3509 meetings, with an attendance of 33,794; 8300 women cooperated on one or more of the subprojects, changing 138 practices in some phase of selection, construction, or care of clothing.

Varying numbers of local merchants in each county cooperated by raising the standard of dry goods and of sewing and laundering equipment carried, and by increasing the variety of these.

In addition to preparing subject matter and giving instruction at training meetings, the college specialists conferred with the executive committees in twenty-five counties, and furthered organization and development of

the project through assistance at advisory council meetings in thirty counties, district rallies in three counties, and the annual meeting in one county, reaching 3279 persons in addition to the 2117 reached at the training meetings.

Supplementing the concentrated work on the four subprojects developed by the local-leader method, classes in garment making were conducted in four counties and three cities, in millinery in twenty-one counties, in dyeing and dry-cleaning in one county, in textile testing in one county, in healthful and corrective corsetry in eight counties, and in healthful and corrective footwear in two counties.

Home hygiene and sanitation. The health study referred to in last year's report has been continued, 150 homes having been scored according to the standards indicated as bases for the study. Changes have been reported by 10 per cent of the homes scored. An open-mindedness which includes self-study both in the homes and in the community is apparent, so that more far-reaching results should be noted another year. The specialists have given 69 lectures, in eight counties, on the relation of the rural home to community health and on home hygiene. The total attendance at these lectures was 2685.

Home management. The resident instructor in home management has prepared a project on the convenient kitchen, to be developed as a correspondence course. The material already prepared includes subject matter on arrangement of the kitchen, selection of small kitchen equipment, correct working heights, floor finishes and coverings, walls, and wood-work. Suggestions are included by means of which the homemakers cooperating will study their own kitchens in these respects and report back to the college specialist for further suggestion and assistance. During the last few months of the second semester the instructor visited seventeen counties and one city, giving 31 lectures at community, district, and county-wide meetings, with a total attendance of 1384.

Instruction on home surroundings and interior decoration has been a part of the program in seven counties. Assistance by specialists from the college has been given in redecorating home bureau offices and in furnishing and decorating rest rooms and community houses. Requests for more assistance than is available have been received for this type of service.

Child training. The resident instructor in child training visited twenty counties, gave 38 lectures, and reached 3715 persons. Her work has been far-reaching in stimulating interest and directing thought toward the importance of the early years of the child's life and toward the child's constant need for sympathetic understanding and intelligent guidance. Requests have been received from most of the counties visited for a full-time specialist in this project, and for a series of lectures rather than a single one in each community visited.

Civics. Civic programs and a few civic projects have been developed in fifteen counties. The programs have ranged from single lectures to programs of instruction under well-qualified county leaders. The subject matter has included local government, rural schools, school law, and parliamentary procedure. Most of the counties have cooperated whole-heartedly with the Committee of Twenty-One on the recent survey of rural schools in the State, and plan to cooperate further by giving

publicity to the report and by carrying out plans suggested by the committee for raising the standards of rural schools in the county.

Development of a fine community spirit, good fellowship, and much wholesome fun, have resulted from the community picnics, "sings," plays, historical pageants, fairs, and socials which have become a part of the home bureau program in most of the counties. Incidentally these programs have contributed funds for use in meeting the expense of sending local leaders to the training meetings, through which the more serious phases of home-bureau work are promoted.

Landscape Art

During the past season there has been a marked increase in the calls for extension service from the Department of Landscape Art. This has been due to three factors.

Return calls have come from each one of the nineteen counties served last year. The progression has been from the popular inspirational lecture to some definite action, such as the improvement of the local public-building properties or the rural schools, or a general home-grounds-development contest. In one county a complete county-wide project has been started. Demonstrations and lectures held in sections where earlier work has been attempted have met with increased interest and larger attendance. From these facts it may be concluded that there exists a growing demand for education concerning the problems covered by landscape art.

This year, for the first time, the scope of the department's activity was made known to all of the county agricultural and home demonstration agents. This resulted in calls to five new counties, and in a broader program of work. The calls from these two sources are best illustrated by a comparison of the number of lectures and demonstrations given. Last year there were 16 lectures and demonstrations, with a total attendance of 1743, while this year 39 have been given, attended by 1912 persons.

At the present time the demands for aid are greater than the department's ability to supply. Great care has been exercised to select only those problems which are educational and which in no way conflict with the practice of the professional landscape architect. Attention is therefore confined to the more modest requests for aid, and preference is given to those projects that will benefit the greatest number of people.

The kind and amount of field work done by the department is indicated by the following summary: community planning, 2; farmsteads, 13; schools, 24; parks, 4; libraries, 1; churches, 1; grange halls, 2. There were 31 lectures given, with an attendance of 1743; 8 demonstrations, attended by 169 persons; 46 inspections made; 529 letters of information written; 32 plans furnished; 3 articles written, containing 21 pages and with a distribution of 4250; 9 newspaper articles aggregating 8 columns; 1 circular letter written to 45 persons; 1950 mimeographed articles distributed.

Meteorology

The principal extension projects of the Department of Meteorology are the dissemination of special weather forecasts (1) to the fruit grow-

ers for use in connection with spraying operations and (2) to general farmers for use during the harvest season. In both these projects the department has had the full cooperation of the United States Weather Bureau and the county agricultural agents.

At the beginning of the season, in March of 1922, the spraying forecast service was reorganized and the work was placed in charge of the local Weather Bureau office, the United States Weather Bureau supplying the necessary morning and evening circuit reports and the College bearing the expense of the telegrams to the county agents. Because of the necessary consultations with specialists, this arrangement was a great improvement in convenience over the plan heretofore followed of issuing the forecasts from Rochester. Information is not yet available, under the new arrangement, on which to base any statement as to the value of this service to the fruit growers in the nine counties included in the service.

Special harvest weather forecasts were supplied last season (from June 15 to August 31, 1921) to ten counties. Twenty-nine counties asked for the service for this season, but due to lack of funds only twelve counties could be included. Reports are not available for the current season at the time of preparing this report, but reports of county agents and letters from farmers based on the service of 1921 indicate that the plan is feasible, that the information reached the farmers in ample time to be of service, and that the forecasts were of value to those who made use of them.

Reports from nine of the counties receiving the service indicate that during the ten weeks from June 20 to August 27, 1921, a total of 4104 telephone calls for harvest forecasts were received from farmers at the county agent offices. In Chemung County the number of such calls reached 1206.

The United States Weather Bureau recognizes the possibilities of both the spray- and the harvest-forecast service, and is fully committed to the project of combining the two, with headquarters at the Ithaca Weather Bureau office, with the necessary additional reports and assistance to handle the work effectively on a state-wide basis.

Plant Breeding

The extension activities of the Department of Plant Breeding have had for their aim the widest possible use by the farmers of the State of improved varieties and strains of crops. It naturally takes time to bring about such wide distribution, because farmers generally cannot be interested in an improved variety or strain until there is an established source of seed, and seed growers can hardly be expected to produce large quantities of an article for which at the time there is no recognized demand. With several of our strains of cereals, however, this preliminary stage has been passed and the new strains are being propagated and grown on a considerable scale.

It is obvious, therefore, that the department's efforts must be directed toward (1) the establishment of reliable seed sources, and (2) the acquainting of farmers with the merits of the best strains in comparison with their own stocks. Under the first of these heads, arrangements

have been made with individual farmers as heretofore, with seed companies, and with farmers' organizations, to propagate under a system of inspection by the department such new strains as have been thoroughly tested and their adaptability proved. In this connection, it should be noted also that the department is cooperating with a group of seed growers who are forming a seed-improvement association to propagate and distribute our improved seeds.

In order to acquaint farmers with the merits of improved strains, demonstration plantings are made in many counties in cooperation with county agents, and field meetings are held at the farms on which the plantings are made. In addition to this primary method of interesting farmers in these strains, talks on the value of good seed are given on appropriate occasions, exhibits are made at the State Fair, and other means are employed.

The department contributed 223 man days in the field, distributed as follows: 33 demonstration meetings, attended by 788 persons; 40 lectures before 972 persons; 17 conventions and conferences with 91 persons; 290 inspections or farm visits; 3 schools making 205 contacts; 17 days with exhibits, in the course of which some 425 persons stopped to ask questions; and 1 farm and home institute, attended by 50 persons. Office work included 13 articles written, 12 circular letters, and 1023 personal letters.

As a check upon the effective distribution of seed through the publicity given, a circular letter of inquiry was sent to about 70 men who were growing varieties of grain recommended by this department. Many of these men had bought seed one year before, and in some cases their replies indicated that they were using all of their crop for seed purposes on their own farms. No letters were sent to commercial firms handling seed in the regular way, although a large amount of the recommended seed was sold by these concerns, the supply in some cases being obtained from inspected fields.

From 25 men who replied to the letter as having sold seed, it was found that 3560 bushels of oats was distributed among 180 purchasers, 574 bushels of wheat among 19 purchasers, 1165 bushels of corn among 139 purchasers, and 183 bushels of barley among 32 purchasers. The actual number of purchases of seeds is much larger, since a considerable amount of corn, oats, and wheat was distributed through the cooperative and other seed companies.

A considerable number of cooperators now engaged in growing recommended strains for seed purposes are planning to form a state improvement association, and certain preliminary steps have been taken to this end. This association will itself become responsible for inspection of seed grains, and through its selling organization the state-wide use of the recommended varieties may be more rapidly brought about.

Some of the more important strains developed and distributed are as follows:

Oats: Five pure-line selections have been obtained — Cornellian, Standwell, Comewell, Empire, and Selection 343 — and are now available in commercial quantities. All of these varieties are of the tree-oat types. They are the survivors from a very large number of trials and are especially adapted to New York conditions.

Winter wheat: Honor and Forward are the selections that have proved the most valuable. The former is beardless, and has a bronze chaff and white kernels. It is a heavier yielder, stiff-strawed, and resistant to hessian-fly injury.

Barley: Featherstone No. 7 and Alpha are the two sorts that have excelled all others tested at the experiment station over an eight-years period.

Corn: Cornell 11, a yellow dent maturing in from 115 to 140 days, is a high yielder on good soil and has proved the best variety for western New York. Other superior sorts now thoroughly tested and recommended for silage in northern New York, and in all sections where the elevation exceeds from 600 to 800 feet, are Webber's Early Dent, Cornell 12, Alvord's White Cap Yellow Dent, and Onondaga White Dent.

It is difficult to estimate what the development and dissemination of these seed strains mean to New York State growers, but the value would certainly run into very large figures. In terms of increased yields, carefully prepared estimates show an average gain over locally used sorts of from 15 to 16 per cent with wheat and oats, and from 10 to 20 per cent with corn. The last-named is more difficult to estimate and shows a wider variation.

Plant Pathology

The extension work of the Department of Plant Pathology continues to increase from year to year, due largely to greater demands from the farm bureaus as a result of a better appreciation of the losses caused by plant diseases.

Projects conducted during 1920-21 have been continued in 1921-22. During the current season there are nine field assistants engaged in the spray-information-service project, being supervised jointly by the Departments of Plant Pathology and Entomology. The crops involved in the service are fruits, and potatoes, onions, and other vegetables. About 3500 growers, who largely support the work financially, are receiving direct service of some kind from these assistants. At least as many more are indirectly receiving this service and depending on the information sent out.

Potatoes. Nearly a thousand potato growers are following the complete program for potato-disease control, involving seed improvement, seed treatment, and protection of vines by spraying and dusting. The good results obtained from seed treatment have induced a continually increasing number of growers to adopt this method.

Potato-scab control by the application of sulfur is a new method which has not been well worked out for this State but is being tried by at least twelve growers in demonstrations.

The results of the certified-seed project are evident in the greatly increased sale of certified or improved seed to growers in the State, and in the greater acreage planted with such seed. They should be reflected also in a larger average yield per acre after a few years, when comparison can be made over a period of years. Seed improvement is being forwarded also by the variety, strain, and seed-source tests conducted by the county agents cooperating with the Departments of Vegetable Gar-

dening and Plant Pathology at the College. These tests not only help growers to determine the best seed for their conditions, but also stimulate interest in good seed among growers of the community. The practice of protecting the vines by spray or dust during the season is becoming more general and is almost universal among seed growers. The dusting method especially has increased greatly in favor during the past year.

Definite potato-disease-control work will be conducted in thirty or more counties, requiring the time of two specialists during two summer months. The department also has the administration of the potato-inspection work for groups of growers, which last year involved 1564 acres of 253 growers in 26 counties. Two inspectors were employed during the season, whose salary and expenses were paid from fees charged for the work. These were based on actual cost and amounted to 53 cents per inspected acre, or a trifle less than 1 cent per bushel of those passing all inspections.

Corn. Extension work in the control of root, stalk, and ear rot of Luce's Favorite seed corn was conducted in cooperation with the Suffolk Cooperative Association. The work consists of selection of ears, seed testing, and maintaining seed plots. A few growers are being instructed in these methods so that they will be able to continue them for the association in a year or two without the assistance of the specialist.

Onions. The onion-smut-control work is progressing rapidly. As a result of demonstrations made in the onion district at Canastota a few years ago, followed by winter meetings since, nearly every onion grower uses formaldehyde at the time of sowing. The practice has been established also at Williamson and in the Florida district. A majority of the growers in the latter district are Polish and it has been difficult to get them to adopt new methods. Exact figures showing change of practice will be available for the next annual report, but it appears now that in this district twice as many growers are using formaldehyde this year as used it last year. Considering the prevalence of smut in these districts, and the heavy losses caused by the disease, the result of the increase in use of formaldehyde must be a greater production per acre.

Miscellaneous. While these major projects require the majority of the time of the specialists, there is miscellaneous work to be done, such as responding to calls for lectures, making farm visits, attending conferences, making office calls, and conducting correspondence, and other office work that requires the attention of one specialist most of the time.

Plant-disease-survey work has been continued in cooperation with the United States Department of Agriculture. Attempts have been made to gather information for this survey from weekly reports of the field assistants, from potato-inspection reports, from correspondence, and from special surveys. Such survey reports are of great aid in emphasizing the most prevalent diseases and in reporting the presence of new diseases that might become a menace to crops. They aid the extension specialist in planning his work most effectively.

A survey of grainfields in thirty-six counties to determine the distribution of the newly imported disease known as "take-all," revealed the fact that when good cultural methods are practiced the disease does not become severe.

In cooperation with other departments and agencies, an examination of certain white pine areas was made which confirmed earlier reports of the general distribution and serious losses being occasioned by the white pine blister rust.

As a measure of activity, it may be noted that the department gave instruction in 4 extension schools making 946 contacts, in 1 farm-and-home institute attended by 69 persons, in 6 community meetings with 161 present, and in 61 field meetings attended by 2382 persons; made 762 field inspections and farm visits; conducted 3 demonstrations attended by 12 persons; inspected 48 potato-variety tests; wrote 4556 letters in reply to special inquiries; and sent out on request 65,330 leaflets giving information on disease control.

Pomology

Extension specialists in the Department of Pomology spent 232 days in the field. They conducted 132 demonstrations with an attendance of 2336; gave 22 lectures with an attendance of 896; held 39 formal conferences with 958 persons; made 223 farm visits; and taught 1354 persons in extension schools and 3121 at farmers' institutes. In addition, 33 extension articles, with 242 pages, were prepared. Due to lack of printing funds the supply of reading-course lessons and other extension publications in fruit growing became exhausted during the year, so that it was necessary to prepare circular letters covering information frequently demanded. Such letters were sent in response to approximately 900 inquiries, and in addition 1335 letters were written answering specific questions regarding fruit culture.

Joseph Oskamp assumed duties as Extension Professor of Pomology on September 1, and he has had opportunity to become acquainted with the pomological problems of New York. Arrangements have been made so that each of the extension workers will have an opportunity to spend one term every other year in resident teaching, which, it is believed, will result in mutual benefit to both teaching and extension activities.

Pruning. Pruning still continues to be one of the most popular subjects of inquiry, probably because the College has some very definite figures which have been worked out experimentally under New York conditions. In order to effectively drive home the truths of the teaching, many pruning demonstrations have been put on a five-years basis. Practically all of the pruning in Wayne and Columbia Counties is now long-term in nature. Where the same trees are pruned year after year, the growers can actually observe the progress being made in response to the treatments, and the interest in the work not only is sustained but increases from year to year.

Cultural methods. In the orchard soil-management problems, particular attention has been given to the importance of early plowing. Apparently these teachings are being put into practice, as was evidenced in the spring of 1922 by an unusually large proportion of orchards already plowed before the trees were in full bloom. The long-term demonstration principle applies with equal if not added force to orchard soil problems. There has been an increasing demand for grapes and small-fruit work, and subprojects along those lines have been specifically outlined.

Packing. The demand for extension work in connection with the organization of new fruit-packing associations has been less than in past years, because the established organization, with headquarters at Rochester, has been able to take care of most of this work in western New York. However, calls for information regarding the arrangement, equipment, and management of packing houses have come from the Hudson Valley, where the organizations are just starting.

Results. Owing to the perennial nature of the plants with which pomology deals, it is very difficult to measure accurately the results of extension teaching in this field. At best, it takes several years before results become apparent. Nevertheless, those who have been closely in touch with the work are able to observe differences in certain orchard practices. In the case of pruning young fruit trees, for example, the tendency is to remove much less wood than formerly. Such moderate pruning, as compared with heavy pruning, should result in an increase of more than 100 per cent in the production of young orchards. There is also a tendency to modify the practice of cultivation by plowing before the bloom, if possible. Furthermore, in many cases, cultivation is stopped earlier in the year in order to permit good growth of the cover crop. The use of nitrogenous fertilizers on land that cannot be plowed is becoming more extensive, but, on the other hand, many growers have learned that complete fertilizers are not necessary for fruit trees on cultivated land.

As a result of demonstrations, growers have learned that trees girdled by mice can be easily saved by a practical method of bridge grafting. In the Hudson Valley, from 85 to 95 per cent of the trees that have been injured in this way have been saved in recent years.

In western New York the fruit growers are now operating successful cooperative packing houses, and the Hudson Valley is doing excellent work along similar lines. The extension specialists in pomology have been active in fostering the preliminary work of establishing and managing such central fruit-packing associations.

Rural Education

The growth of the junior-extension organization and work has been steady during the past year. Five counties with full-time paid leadership have been added, and a sixth, which has heretofore employed only half-time leadership, has advanced to full-time leadership. The total number of girls and boys enrolled in the work during 1921-22, according to the records of the central office, was 15,064, an increase of approximately 27 per cent over the preceding year. Of these, 72 per cent were in counties maintaining paid leadership. Further details are given on page 121.

The four numbers of the *Cornell Rural School Leaflet* have been issued promptly during the past year. Of the pupils' editions 319,470 copies have been distributed, and of the teachers' edition 23,800 copies. It is unfortunate that the funds available for printing will not permit the more general distribution of this helpful publication. It is impossible to meet the demand for it.

The plan of holding a Superintendents Week immediately following Farmers Week has met with a cordial reception on the part of district

superintendents. The attendance and interest were even better this year than at the preceding conference.

It has been impossible for the Department of Rural Education to meet all the requests for addresses at conferences of teachers and meetings of patrons interested in school problems. However, 23 such addresses were given, with an aggregate attendance of 2595.

Rural Engineering

The chief extension activities of the Department of Rural Engineering are directed to teaching and demonstrating the desirability and practicability of the installation of drainage systems and of farm water-supply and sewage-disposal and other home conveniences, including the development of power units; the care and maintenance of internal-combustion engines; and the equipment and use of the farm shop. The methods chiefly employed in the work are schools and field demonstrations, the former primarily in connection with instruction in gas engines and the farm shop, the latter mainly with the drainage project.

Relative emphasis is indicated in the following statement of distribution of effort, mainly of the three full-time extension specialists employed. The total number of man days in the field was 561, with a total number of personal contacts of 20,549. This work was divided mainly among the following projects: drainage, instruction that had to do with gas-engine and shop work; water-supply meetings; teaching rope splicing and knot tying; and conducting radio demonstrations.

Drainage. Prominent in the work of the department is that in connection with land drainage. Specific farm problems are studied directly in the field, and the work actually laid out so that the drains will be put in with the proper slope, of the correct size, and according to a layout that would be the most economical of ditch for the problem in hand. An aggregate of hundreds of thousands of rods of ditch have been laid out, and tens of thousands of acres drained, since the work was begun some twelve years ago. During the past year, 23,350 rods of ditch were laid out for tile drains, benefiting 2580 acres of land. In addition, 3380 rods of open ditch were laid out which benefited 17,480 acres.

This work was comprised in some 230 separate projects, located in most instances by the county agents at places where the improved tillage conditions and the better crops resulting from the drainage would serve as the most effective demonstrations of the advantages of drainage. The drainage of land increases its fertility, thus increasing the productive power of the State and the taxable valuation of its farms.

The work during the winter months consists very largely of schools, most of which are of four or five days duration.

Gas engines. The gas-engine school is a development from the tractor schools conducted by the department during the war. The topic is an important one, since the gas engine enters into automobiles, motor trucks, tractors, lighting plants, and isolated power units on the farm. The farmers are interested because they know from experience that the training is necessary for them, and a further incentive to interest is the fact that after two or three days of preparatory demonstration and instruction

many farmers in the school bring their own small engines, and the engine owners and their friends in the school proceed to overhaul these engines under the direction of the instructors. The engines are almost invariably out of adjustment as to time of operation of the valves, and ignition mechanism. Error in adjustment leads to much trouble, delay, and loss of efficiency among engines in the country. At these schools the actual running of the correctly adjusted engines effectively convinces the farmers that the instructor was correct in his teaching. Repeated instances have occurred in which students in the school, while at home overnight, have adjusted their engines according to instructions and reported the next day the radical improvement that resulted. In numbers of schools, engines that were locally well known as giving trouble have been adjusted by the class and instructor together, and restored to perfect working condition. Not only do the adjusted machines continue to give better service as a result of the school, but many members attending are able thereafter to be of great help in their community as engine experts.

Farm shop. The farm shop, with its equipment of tools, needs to be in working condition. Schools that teach the filing of saws and the sharpening of edged tools meet with great favor and bring in from farms many tools to be put in order. At the shop schools the repair of harness also is taught, and dozens of harnesses have been put in good condition by members of the school. A very complete bulletin on harness repairing has been prepared, and copies are given out to be hung in the home shop as a ready reference later.

Soldering is taught with success in the shop schools. Attending members bring in a great variety of milk pails and cans, kettles, and other utensils, to repair under expert direction of the teachers.

Rope work, including the splicing and repair of hay ropes and the tying of a few of the more important knots and hitches, always meets with popular interest. This work is given in shop schools and also has been made a special topic of meetings. Last spring, just before haying, two weeks were devoted with great success to barn meetings on rope work. At a typical meeting from twenty to thirty farmers would be present, of whom from six to eight would have brought in their hay ropes to work on and splice. In addition, smaller ropes provided by the instructor for all present gave opportunity for preliminary practice. A much-needed revision of the now exhausted bulletin on knots is in preparation.

Sewing machines. Sewing-machine schools at which women work on their own machines, cleaning and taking up wear in the bearings and finally adjusting the timing of the needle and the shuttle, were tried last winter for the first time and met with instant success. It was found that, since women were at first only mildly interested, in order to arouse distinct enthusiasm it was necessary only to select a particularly noisy and ill-working machine, and then, by cleaning, explaining, and adjusting it before the class, put it in easy and quiet running condition. Since the four trial schools were held, word has come in of instances in which members have overhauled their machines most radically, with most excellent results, so that the purchase of new machines has been made unnecessary.

Water supply and sewage disposal. Water supply is a most important topic, to which a great deal of effort was devoted the past year. The subject was presented in a great variety of ways — by blackboard talks, lantern-slide talks, moving-picture talks, and actual demonstrations with adequate, specially prepared apparatus carried on a truck. The truck equipment this year was much lighter and simpler than that first used, two years ago, thus permitting two meetings a day instead of one, and by requiring only two men it will be cheaper to operate. Bulletins on water supply and on sewage disposal have been prepared to further this work. Special concrete-form fittings have been devised by the department to enable the farmer to solve cheaply the difficult problems of sewage disposal. Forms for making these fittings are being manufactured and will be furnished to farm bureau offices for the use of any one needing them. The department has been advising farmers on their sewage problems for the past twelve years, and hundreds of septic tanks suggested are in satisfactory operation as a result. Many of these tanks were recently studied to verify the correctness of their design after years of use.

Radiophone. The meteoric rise of the radiotelephone into the field of popular interest found the department alert to the situation. Apparatus was obtained and demonstration meetings were held. It was not found practicable to discuss the topic technically, but simple explanations, practical reception of radio concerts, and advice as to what to buy, met with much favor. Entertainment by this means might well serve as the lighter part of meetings on other topics.

Farm structures. Although there was no member of the extension staff assigned to the problems in farm structures, the resident teacher of this subject devoted a considerable proportion of his time and energies to answering each month an average of from 25 to 30 letters of inquiry, and in preparing and furnishing blueprints of designs of cow and horse stables and other farm buildings. For example, following a violent wind-storm which destroyed his buildings a farmer was given immediate and much needed help in rearranging his farmstead, and was also furnished with drawings and bills of materials to aid him in sawing new materials from his own woods with which to build.

Rural Social Organization

The extension instructor in the Department of Rural Social Organization has devoted himself to the field of rural recreation and has given chief attention to the training of local leadership through one-day schools. Nineteen of these schools have been conducted during the year, mostly under the auspices of the home bureaus. It is planned to hold three or four of these schools during the coming year, at intervals of a month or six weeks, in those counties desiring them. The extension instructor spent 69 days in the field, addressed 103 audiences with a total attendance of 14,322, and conducted a correspondence comprising 1408 personal letters and 11 circular letters sent to 2586 persons. The head of the department gave 6 lectures, attended 10 conferences with a total attendance of 992, and wrote 355 letters on extension matters. This makes a total for the department of 85 days in the field, 113 audi-

ences with a total attendance of 15,314, and 1763 letters exclusive of circular letters. Loan collections of plays for the encouragement of rural dramatics were circulated, and 226 loans were made during the year.

Under the direction of the department, a bulletin entitled *The Historical Pageant in the Rural Community* was written by Miss Abigail Halsey. This bulletin gives instructions for the writing and production of a historical pageant by a rural community in a concise and practical manner. Such information has not heretofore been available in published form, and the bulletin will undoubtedly be of great assistance in the encouragement of rural pageantry.

There continues to be a considerable demand for assistance in community organization, the development of community buildings, the organization of community clubs, and other related activities. Comparatively little, however, has been done in this direction, since for effective results the adviser should spend several days in the community studying the situation, and the time available did not permit undertaking many such projects.

The recreation project has been adopted and is being developed in sixteen counties. Of these, ten are working on the local-leader basis. Among the achievements that can be definitely credited to the work on the recreation project are the establishment of five cooperative playgrounds at county fairs and picnics, the presentation of seven community plays and three community pageants, and the establishment of twenty-five rural recreation centers, all with the object of providing wholesome recreation for farm people.

Among the activities in which the work of the recreation project has played an important part are the establishment of Little Country Theaters at county fairs and the encouragement of pageants and folk dancing at county fairs, all aiming to offset the sometimes questionable attractions of the midway. This year at least four counties are planning to present a Little Country Theater at the county fair. Other counties are showing interest. One county will also introduce folk dancing as a special feature at its county fair. Six counties are planning to present historical pageants at their county fairs. Recreation features are coming to be a prominent part of the program of county and community picnics.

While concrete results in this field are somewhat intangible, the benefits of the work are expressed through better community spirit and tone. As the state home demonstration agent leader has expressed it, "The recreation project has provided in an untold number of communities that foundation of sociability which is necessary for carrying out the projects for home and community improvement."

Vegetable Gardening

As in the past, two distinct lines of work have been conducted by the Department of Vegetable Gardening during the year, one dealing with commercial gardening and the other with home gardening, school gardening, and crops-club work. The work in commercial gardening has been handicapped during the last six months of the year, due to the fact

that the position of assistant extension professor has been vacant since the resignation of Professor J. R. Bechtel on December 31, 1921.

In commercial gardening, special effort has been made to take to the growers the best information available from experimental results obtained in this and other States. This has been done through demonstrations, lectures, and articles in the press. Practices have been improved as a result of this work, as is illustrated by the following examples.

Experiments have shown that a small celery crate is better than a large one, especially when the product is stored. A small crate has been adopted by an association in Wayne County, which grows probably more than one-fourth of the celery crop produced in the State. This has resulted in adding to the growers' returns for celery, and has benefited the consumer.

Experiments with fertilizers on muck soil have proved that nitrogen is not necessary for onions, and that one-half of the usual application of potash to lettuce gives as good results as the full amount. Hundreds of the best growers have changed their fertilizer practices as a result of educational work done along this line, resulting in a considerable saving in their fertilizer bills.

Cauliflower-strain demonstrations in Suffolk County showed a variation of more than 20 per cent of marketable heads between supposedly good strains of the same variety. Practically all growers on Long Island and in other parts of the State are now using seed of the strain that gave the best results in the demonstrations.

Similar results to those mentioned have been obtained in all of the other demonstrations, and the lessons learned are being put into practice.

Demonstrations. During the year the following demonstrations were conducted in cooperation with the county agents: strain demonstrations on late cauliflower, late cabbage, early cabbage, tomatoes, celery, lettuce, and onions; fertilizer demonstrations on celery, lettuce, and onions on muck soil, and on tomatoes on upland soil; cover-crop demonstrations; plant-growing and plant-grading demonstrations with tomatoes and cabbage.

At the beginning of the 1922 growing season the demonstration work on potatoes and field beans was turned over to the Department of Vegetable Gardening. These cover demonstrations on potato types and source of seed; demonstrations on size of seed piece and rate of planting; fertilizer demonstrations on potatoes, field beans, and cabbage; and variety and type demonstrations on field beans.

Up to June 30, 1922, about 120 demonstration plots had been started in 36 counties.

Advanced reading courses. The advanced reading course in vegetable gardening has been entirely rewritten. Instead of questions being asked, to be answered from a textbook, the lessons are outlined and references are given as to where the material can be found in bulletins (which are sent) and in two textbooks. Question sheets are then sent, and the questions are such that they cannot be answered by copying from a book. During the year, 146 papers have been graded and corrected.

At the end of June, 1922, there were 24 persons taking the course, which is an increase over any previous year.

Home and school gardening and club work. One man has devoted his entire time to home gardening and to junior work in the corn, bean, potato, and garden projects. Home-garden extension work has been conducted by press articles sent out through the Office of Publications to the daily and weekly papers of the State, by personal letters, and by lectures. The circulation of press articles was between 2,500,000 and 3,000,000.

The home-garden extension work by lectures entered a new phase this year in cooperating with the nutrition extension work of the School of Home Economics. A garden plan has been worked out conforming to the recommendations of the School as to the amounts of different vegetables needed by one individual in one year, and this plan has been presented to groups of local nutrition leaders in four counties. This type of work began rather late in the spring, but a considerable expansion of it is expected for next year.

The same idea of cooperation with the home economics extension workers is carried into the junior garden work. Lectures and material prepared for use in this project have emphasized the growing of those vegetables which are especially recommended from the nutrition standpoint, such as tomatoes, leaf crops, and others. This correlates the junior garden project with the junior canning project.

The potato project emphasizes better seed, seed treatment, and, to a less degree, spraying with bordeaux. Reports of the work are not yet available from organized counties, but it is believed that more than half of the potato-project workers use certified seed, at least in part. Probably a somewhat larger proportion treat their seed. Relatively few spray except for insect control. The practical difficulties are very great especially when there is no spraying outfit on the project worker's farm.

Twenty exercises or lessons in the garden project, and twelve programs for use at garden-club meetings, have been prepared during the year. Twenty similar exercises for the potato project also have been prepared. These exercises have been very plainly written, with definite bulletin references, in the hope that teachers or other local leaders who are very little acquainted with the subject may be able to use them. Further exercises in each of these projects are in preparation.

Summary. A partial summary of activities follows: days in the field, 264; demonstrations 41, attendance 1423; lectures 207, attendance 15,494; conferences 94, attendance 1167; extension schools 2, attendance 232; inspections and farm visits, 273; fair exhibits judged, 13 (4 days); circular letters 61, circulation 1352; other letters, 2867; articles written 90, number of pages 130.

SUMMARY OF FIELD ACTIVITIES OF EXTENSION SERVICE**Agriculture**

Type of activity	Number of personal contacts
Extension schools, 67.....	27,644
Institutes, 262	23,415
Lectures, 1289	85,557
Demonstration meetings, 1212	32,404
Conferences, 912	11,686
Farm visits and inspections, 3995.....	3,995
Farmers Field Days, 2.....	1,100
Farmers Week, 1	3,830
Exhibits at State Fair and at county fairs, 187....	No record
Special field assistance, 4557.....	15,353
(Growing season of 1921)	
Poultry-judging school, 1	81
(At the College)	
Spray-service school, 1	16
(At the College)	
Rural education conference, 1	92
(At the College)	
Annual conference of county agents, 1.....	126
(At the College)	
Total	205,299

Home economics

Extension schools, 2	132
Institutes, 262	8,048
Lectures, 369	21,993
Demonstration meetings, 532	14,204
Conferences, 632	3,666
Inspections, 1	1
Exhibits at State Fair and at county fairs, 10....	No record
Total	48,044

Agricultural agent system

Lectures, committee meetings, and conferences, held by state county agent leaders, 334.....	15,920
Meetings, demonstrations, and so forth, organized or addressed by county agents and assistants, 6957	520,022
Total	535,942

Home demonstration agent system

Lectures, committee meetings, and conferences, held by state home demonstration agent leaders, 328	15,059	
Meetings, demonstrations, and so forth, organized or addressed by home demonstration agents and assistants, 18,234	366,634	
	<hr/>	
Total		381,693

Junior extension system

Lectures, meetings, and conferences, held by state junior extension leaders, 568.....	4,925	
Meetings, demonstrations, and so forth, organized or addressed by junior extension leaders and as- sistants, 121,236	198,446	
	<hr/>	
Total		203,371
		<hr/>
Grand total of personal contacts.....		<u><u>1,374,349</u></u>

REPORT OF THE DEAN AND DIRECTOR

SUMMARY OF FIELD SERVICE BY SUBJECT-MATTER EXTENSION SPECIALISTS

(July 1, 1921, to June 30, 1922)

Department	Num- ber of days in field	Demonstration meetings		Lectures		Conferences		Num- ber of in- spections	Attend- ance at schools	Days at ex- hibits	Attend- ance at institutes	Num- ber of contacts
		Num- ber	Attend- ance	Num- ber	Attend- ance	Num- ber	Attend- ance					
Agricultural Chemistry.....	6	...	...	2	28	3	11	71	2,324	...	65	104
Agricultural Economics.....	214	25	442	86	5,439	64	775	445	...	...	522	9,573
...	420	24	1,213	159	7,289	88	975	438	2,512	7	6,859	19,293
...	660	179	5,479	335	9,172	98	703	438	1,520	7	10,767	28,079
...	276	74	3,881	41	1,948	215	1,363	123	950	25	523	8,788
...	192	30	1,180	45	10,798	54	2,109	154	687	...	...	14,928
...	3	...	...	3	70	1	4	...	...	...	...	83
...	114	31	188	31	2,292	59	434	51	...	...	...	2,905
...	46	8	169	31	1,743	...	...	46	...	...	...	1,958
...	223	33	788	40	972	17	91	290	203	17	...	2,396
...	277	61	2,382	6	161	26	693	768	946	...	30	5,013
...	232	132	2,336	22	896	39	958	223	1,354	...	3,121	8,588
...	911	412	9,561	197	8,301	86	1,047	1,004	4,450	60	608	24,971
...	20	...	...	23	2,595	...	...	...	...	...	...	2,595
...	561	162	3,362	94	4,061	15	211	113	12,264	49	536	20,549
...	85	...	...	53	14,169	53	1,145	...	...	6	...	15,314
...	264	41	1,423	207	15,494	94	1,167	273	232	4	295	18,884
...	7	...	...	4	120	...	...	...	200	...	...	320
Home Economics.....	955	90	10,116	...	...	...	...	5,237	...	...	...	15,353
Grand total.....	5,466	1,302	42,520	1,289	85,557	912	11,686	9,232	27,644	187	23,415	200,054
...	1,158	532	14,204	369	21,993	632	3,666	1	132	10	8,048	48,044
Grand total.....	6,624	1,834	56,724	1,658	107,550	1,544	15,352	9,233	27,776	197	31,463	248,098

* The number of persons doing extension field work varies during the year, according to field needs. The average for the year was 33 persons on full time, 21 persons on half time or more, and 21 persons on less than half time, and in addition not including 10 special field assistants in charge of the spray service.

RECOMMENDATIONS

Previous recommendations are renewed, not only for enlarged office space, but also for quarters in which all of the offices whose work is so closely related can be brought together on the same floor in contiguous rooms. The efficiency of the work and the cooperation between workers are at present seriously handicapped by the widely scattered and inadequate offices.

The change in personnel among county agents still continues large, and some means must be found which will increase the term of county-agent service and stabilize county-agent employment. While the primary causes for these large changes are not unhealthy, being due chiefly to business and professional offers at considerably increased salaries received by the county agents because of the excellent training gained by them as a result of their work, in the interest of the College some means must be found of holding them more permanently. This will necessitate marked increases in salaries all along the line, increased vacation periods, and a general improvement of the facilities and conditions under which they work. All this means larger county budgets. There is also need for more of the real spirit of teaching based on well-considered facts, and less of the spirit of promotion and propaganda in all county-agent work.

There is great need for broadening out the field of subject matter used in extension teaching, to include the so-called "cultural" subjects — in other words, for general university extension. The extension program of the College of Agriculture, broad as it is, does not yet meet all the needs of the rural communities for education through extension teaching. Moreover, nothing would do more to bring the University as a whole into practical and useful contact with the rural population than the establishment of such a service. The College and the University should together look forward to occupying this broader field.

We have reached the point where it is very necessary that some reasonably accurate means of measuring the results of extension work, and particularly the relative efficiency of different methods in securing these results, should be determined. The effectiveness of extension work generally should be checked up. There is need for a permanent, systematic, and thorough-going study of extension methods. The assignment of Professor D. J. Crosby to such a study is a step in this direction, and the work must be still further developed on a scientific basis if we are to expend and administer in the wisest and most efficient manner upwards of a million dollars which is now available for extension teaching in agriculture and home economics in this State.

Notwithstanding the scope of the extension organization, it is not yet reaching the majority of the rural people nor assisting them in the solution of problems in all the communities. The skeleton of the organization is ample; it needs filling in. The farm and home bureau organization must be developed so as to function in all of the communities and with a larger number of the people in each. The extension machinery must be made to function more completely in every community, so that all who desire information and assistance in working out their problems may receive it, provided only they do their own part.

SUMMARY OF THIRTY YEARS OF EXTENSION WORK

Provision on the part of the State for an extension service in its College of Agriculture marked the recognition of a new and important public function which is essential to the maintenance of a sound agriculture and a satisfied rural population, and hence of the democracy and its more complete functioning in the farming communities. The extension service is a supplement to the educational system, primarily for supplying information and giving agricultural instruction to adults and to girls and boys not in school, and for the general education in agriculture of all the population. Both the public generally, and farmers in particular, need accurate information. The stimulation of thought and action on farm and community problems, and the setting up of goals or standards of achievement, are much to be desired. All of these the Extension Service has supplied to an effective degree.

The history of extension work in New York State for thirty years is most notable and interesting. The farseeing vision and energetic leadership of Liberty Hyde Bailey gave it such impetus at the start that it soon gathered great headway and early became an important part of college organization and work. Its progress has been made in three great periods, each of which had its inception in legislation that made such growth possible. The early farmers' institutes, in which members of the experiment station and the teaching staff had a large part, together with occasional outside lectures by the staff, prepared the way for extension work and for applying the results of research.

In the first epoch the work had its inception in the rural depression in the early part of the decade beginning with 1890. As a result of this depression, an attempt was made to inquire into the agricultural status to discover the causes of the situation, and to suggest educational means for its improvement. The principal means suggested and used in this period were local experiments, bulletins, itinerant lectures and schools, instruction in nature study in the rural schools, correspondence, and reading courses. The period was especially characterized by personal work with farmers and by emphasis on teaching the rising generation in the rural schools something of agriculture. Also the foundation was laid for the fundamental policy of cooperation with farmers, which has been an outstanding feature of extension work in New York from the beginning.

During the second epoch all of the means used in the first were continued and enlarged. The period was marked by the development and extended use of several special means of extension, such as the Experimenters' League, farm trains, and Farmers Week, and by the beginnings of local organization and financing as a means of adequately reaching all the rural people of the State. In this period a greater public recognition of the importance of agriculture and of educational extension service to deal with its problems also was apparent. As the understanding of extension work and its purposes increased, the demand of farmers for it constantly enlarged. At the end of twenty years of extension service, some of the effects were beginning to show in changed agricultural practices, based on scientific facts which had been disseminated and taught, in the tendency toward more intensive study of problems, and in the beginnings of local cooperative effort to solve the problems of agriculture.

The third epoch was, first of all, a period of great expansion, in which local organization made possible by greatly increased financial resources was the chief characteristic. The rising prices and the need for increased food production which came as a result of the war, heightened the interest in agricultural problems on the part of both farmers and the general public, and encouraged organization to meet them. This period saw the rise of cooperative organization for buying and selling among farmers, and an insistent demand for enlarging the scope of the extension service to include marketing problems. But the outstanding achievements of this period were the completion of the organization of the county-agricultural-agent system, and the establishment of home demonstration agents in more than half the counties and junior extension agents in more than a third of the counties, together with the organization and development of the county farm and home bureau associations with their 75,000 members and their executive- and advisory-committee systems.

The present status of the Extension Service suggests the end of the major period of expansion. The great need now is for the consolidation of the gains made, and for rounding out and securing the more complete utilization of the service. The period is characterized by an attempt to sift out and slough off non-essentials by the careful study of particular problems and their formulation into community and county programs of work, and by a tendency toward thorough examination of the soundness of the teaching and the efficiency of the methods used. While all of these are of major importance, there is still need to extend the services of the county-agent system to all of the rural communities and the farm people of the State. There is reason to anticipate that this will soon be accomplished. The Extension Service will then be fulfilling the function which its name suggests, of rendering service to all the rural population and to all the people of the State in the development of a sound and satisfying agriculture.

State of New York

**New York State College of Agriculture
at Cornell University**

Cornell University Agricultural Experiment Station

Thirty-Sixth Annual Report

of the

Dean and Director

1923

LIVINGSTON FARRAND, President of the University

**A. R. MANN,
Dean and Director**

**CORNELIUS BETTEN
Vice Dean of Resident Instruction**

**W. H. CHANDLER,
Vice Director of Research**

**M. C. BURRITT,
Vice Director of Extension**

Transmitted to the Legislature January 15, 1924

Cornell Univ
Agri. Exper. Sta.
2-29-1924

THIRTY-SIXTH ANNUAL REPORT

of the

New York State College of Agriculture at Cornell
University and of the Cornell University
Agricultural Experiment Station

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

Albany, January 15, 1924.

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Thirty-sixth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,

Commissioner of Farms and Markets.

(3)

NEW YORK STATE COLLEGE OF AGRICULTURE

STAFF OF INSTRUCTION, EXTENSION, AND EXPERIMENT STATION

Livingston Farrand, A.M., M.D., LL.D., President of the University.
Albert Russell Mann, B.S.A., A.M., Dean of the College of Agriculture, Director of the Experiment Station, and Director of Extension.
Isaac Phillips Roberts, M.Agr., Professor of Agriculture, Emeritus.
John Henry Comstock, B.S., Professor of Entomology and General Invertebrate Zoology, Emeritus.
John Lemuel Stone, B.Agr., Professor of Farm Practice, Emeritus.
Liberty Hyde Bailey, M.S., LL.D., Litt. D., Ex-Dean, Professor Emeritus.
Whitman Howard Jordan, LL.D., Professor of Animal Nutrition, Emeritus.
Mrs. Anna Botsford Comstock, B.S., Professor of Nature Study, Emeritus.
Henry Hiram Wing, M.S. in Agr., Professor of Animal Husbandry.
Thomas Lyttleton Lyon, Ph.D., Professor of Soil Technology.
James Edward Rice, B.S.A., Professor of Poultry Husbandry.
George Walter Cavanaugh, B.S., Professor of Chemistry in its Relations to Agriculture.
George Nieman Lauman, B.S.A., Professor of Rural Economy.
Herbert Hice Whetzel, M.A., Professor of Plant Pathology.
George Frederick Warren, Ph.D., Professor of Agricultural Economics and Farm Management.
William Alonzo Stocking, M.S.A., Professor of Dairy Industry.
Wilford Murry Wilson, M.D., Professor of Meteorology.
Ralph Sheldon Hosmer, B.A.S., M.F., Professor of Forestry.
James George Needham, Ph.D., Litt.D., Professor of Entomology and Limnology.
(Exchange Professor at Pomona College, 1922-23.)
Rollin Adams Emerson, D.Sc., Professor of Plant Breeding.
Harry Houser Love, Ph.D., Professor of Plant Breeding.
Donald Reddick, Ph.D., Professor of Plant Pathology.
George Alan Works, B. Ph., M.S. in Agr., Professor of Rural Education.
Flora Rose, B.S., M.A., Professor of Home Economics.
Martha Van Rensselaer, A.B., Professor of Home Economics.
James Adrian Bizzell, Ph.D., Professor of Soil Technology.
Glenn Washington Herrick, B.S.A., Professor of Economic Entomology.
Howard Wait Riley, M.E., Professor of Rural Engineering.
Harold Ellis Ross, M.S.A., Professor of Dairy Industry.
Hugh Charles Troy, B.S.A., Professor of Dairy Industry.
Samuel Newton Spring, B.A., M.F., Professor of Silviculture.
Karl McKay Wiegand, Ph.D., Professor of Botany.
William Henry Chandler, Ph.D., Professor of Pomology and Vice Director of Research.
Arthur Bernhard Recknagel, B.A., M.F., Professor of Forest Management and Utilization.
Merritt Wesley Harper, M.S., Professor of Animal Husbandry.
Cyrus Richard Crosby, A.B., Extension Professor of Entomology.
Elmer Seth Savage, Ph.D., Professor of Animal Husbandry.
Edward Albert White, B.Sc., Professor of Floriculture and Ornamental Horticulture.
Alvin Casey Beal, Ph.D., Professor of Floriculture.
Herbert Andrew Hopper, B.S.A., M.S., Extension Professor of Animal Husbandry.
Edward Sewall Guthrie, Ph.D., Professor of Dairy Industry.
Maurice Chase Burritt, M.S. in Agr., Professor in Extension Service and Vice Director of Extension.

William Charles Baker, B.S.A., Professor of Drawing.
 Mortier Franklin Barrus, Ph.D., Extension Professor of Plant Pathology.
 Lewis Josephus Cross, Ph.D., Professor of Chemistry in its Relations to Agriculture.
 Oskar Augustus Johannsen, Ph.D., Professor of Entomology.
 Clyde Hadley Myers, Ph.D., Professor of Plant Breeding.
 Bristow Adams, B.A., Professor in Extension Service, Editor, and Chief of Publications.
 Dick J. Crosby, M.S., Professor in Extension Service.
 Asa Carlton King, B.S.A., Professor of Farm Practice and Farm Superintendence.
 Cornelius Betten, Ph.D., Vice Dean of Resident Instruction.
 George Abram Everett, A.B., LL.B., Professor of Extension Teaching.
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 E. Gorton Davis, B.S., Professor of Landscape Architecture.
 Ralph Wright Curtis, M.S.A., Professor of Ornamental Horticulture.
 Jacob Richard Schramm, Ph.D., Professor of Botany.*
 Harry Oliver Buckman, Ph.D., Professor of Soil Technology.
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 Rolland Maclaren Stewart, Ph.D., Professor of Rural Education.
 James Ernest Boyle, Ph.D., Professor of Rural Economy.
 Ezra Dwight Sanderson, Ph.D., Professor of Rural Social Organization.
 Homer Columbus Thompson, B.S., Professor of Vegetable Gardening.
 William Joseph Wright, M.S., Extension Professor of Rural Education and State Leader of Junior Extension.
 Warren Simpson Thompson, Ph.D., Professor of Rural Social Organization.
 Cora Ella Binzel, Professor of Rural Education.
 Byron Burnett Robb, M.S. in Agr., Professor of Rural Engineering.
 Annette J. Warner, Professor of Home Economics.
 James Kenneth Wilson, Ph.D., Professor of Soil Technology.
 Edmund Louis Worthen, M.S., Extension Professor of Soil Technology.
 Julian Edward Butterworth, Ph.D., Professor of Rural Education.
 Roscoe Wilfred Thatcher, B.S., M.A., D.Agr., Professor of Plant Chemistry.†
 Ulysses Prentiss Hedrick, Sc.D., Professor Pomology.†
 Lucius Lincoln Van Slyke, Ph.D., Professor of Dairy Chemistry.†
 Fred Carlton Stewart, M.S., Professor of Plant Pathology.†
 Percival John Parrott, M.A., Professor of Entomology.†
 Robert Stanley Breed, Ph.D., Professor of Dairy Bacteriology.†
 Rudolph John Anderson, Ph.D., Professor of Animal Nutrition.†
 Reginald Clifton Collison, M.S., Professor of Soil Technology.†
 Harold Joel Conn, Ph.D., Professor of Soil Technology.†
 Arthur T. Dahlberg, M.S., Assistant Professor of Dairy Industry.†
 Robert Pelton Sibley, M.A., L.H.D., Professor and Secretary.
 James Chester Bradley, Ph.D., Professor of Entomology and Curator of Invertebrate Zoology.
 George Charles Embury, Ph.D., Professor of Aquiculture.
 Arthur Johnson Eames, Ph.D., Professor of Botany.
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 Olney Brown Kent, Ph.D., Professor of Poultry Husbandry.
 Edward Gardner Misner, Ph.D., Professor of Farm Management.
 Helen Monsch, B.S., M.A., Professor of Home Economics.
 William Irving Myers, Ph.D., Professor of Farm Finance.
 Theodore Hildreth Eaton, Ph.D., Professor of Rural Education.

*Absent on leave.

†By affiliation with the New York Agricultural Experiment Station at Geneva.

REPORT OF THE DEAN AND DIRECTOR

7

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Axel Ferdinand Gustafson, Ph.D., Extension Professor of Soil Technology.
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Forest Milo Blodgett, Ph.D., Assistant Professor of Plant Pathology.
Frank Elmore Rice, Ph.D., Assistant Professor of Chemistry in its Relations to Agriculture.
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Clarence A. Boutelle, Assistant Extension Professor of Animal Husbandry.
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 Loren Clifford Petry, Ph.D., Acting Assistant Professor of Botany.
 Herbert John Metzger, D.V.M., Assistant Extension Professor of Animal Husbandry.
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 Mrs. Ruby Green Smith, Ph.D., Associate State Leader of Home Demonstration Agents in charge of Organization.
 Grace Vida Watkins, B.S., Assistant State Leader of Home Demonstration Agents.
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 Paul Rexford Young, B.S., Assistant State Leader of Junior Extension.
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 Erl Bates, M.D., Adviser in Indian Extension.
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 Lua Alice Minns, M.S. in Agr., Instructor in Floriculture.
 Winfred Enos Ayres, Extension Instructor in Dairy Industry.
 Lewis Merwin Hurd, Extension Instructor in Poultry Husbandry.
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 Joseph Pullman Porter, B.S., M.S.A., M.L.D., Extension Instructor in Ornamental Horticulture.
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Van Breed Hart, B.S., Instructor in Farm Management.
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James Beckley Palmer, B.S., Extension Instructor in Entomology.
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Lawrence Myron Femer, B.S.A., Instructor in Plant Pathology.
Edward Louis Proebsting, M.S.A., Instructor in Botany.
Raymond Bridgman Cowles, A.B., Instructor in Biology.
Irene Thelma Dahlberg, B.S., Instructor in Home Economics and Assistant Man-
ager of the Cafeteria.
Edmund Ellsworth Vial, B.S., Instructor in Animal Husbandry.
Craig Sanford, B.S., Extension Instructor in Poultry Husbandry.
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William Thomas Craig, Assistant in Cereal Investigations.
Walton I. Fisher, Assistant in Plant Breeding Investigations.
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Carl Louis Wilson, M.A., Assistant in Botany.
Mary Isabelle Potter, B.S., M.L.D., Assistant in Landscape Art.
Ruth Gladys Williams, M.A., Assistant in Botany.
Andrew Dillard Suttle, M.S., M.S. in Agr., Assistant in Field Crops.
Stewart Henry Burnham, B.S., Assistant Curator.
Mrs. Ethel Hinckley Hausman, B.S., Assistant in Rural Education.
Daniel Francis Kinsman, B.S., Assistant in Soil Technology.
Hempstead Castle, B.S., Assistant in Botany.
Wayne E. Manning, A.B., Assistant in Botany.
Harold Raymond Curran, B.S., Assistant in Dairy Industry.
Freeman Smith Howlett, B.S., Assistant in Pomology.
Arthur Maxwell Brunson, M.S., Assistant in Plant Breeding.
Cynthia Westcott, A.B., Assistant in Plant Pathology.
Thomas Levingston Bayne, jr., B.S., Assistant in Rural Education.
Charles Grover McBride, B.S. in Horticulture, Assistant in Marketing.
Bernard Smit, B.S., Preparator in Entomology.
Alton L. Markley, B.S., Assistant in Agricultural Chemistry.
Dorothy Willison, B.A., Assistant in Agricultural Chemistry.
Richard Hall Peabody, B.S., Assistant in Dairy Industry.
Cecil D. Schutt, Assistant in Animal Husbandry.
Benjamin William Barkas, B.S., Assistant in Rural Economy.
Fred Harrison Dennis, Assistant in Plant Breeding Investigations.
Stuart Taylor Danforth, B.S., Assistant in Aquiculture.
Elizabeth Keyes, B.S., Assistant in Biology.
Norman H. Stewart, A.B., M.S., Assistant in Biology.
Leola Josephine Kruger, A.B., Assistant in Biology.
Grace Hall Griswold, B.S., Assistant in Entomology.
Frank Lee DuMond, B.S., Assistant in Forestry.
Milislav Demarec, B.S.A., Assistant in Plant Breeding.
Allan Goodrich Newhall, A.B., Assistant in Plant Pathology.
George Quincey Lumsden, B.S., Assistant in Forestry.
John H. McGillvray, M.S., Assistant in Vegetable Gardening.
Franklin David Keim, B.Sc., M.S., Assistant in Soil Technology.
Ray L. Throckmorton, B.S.A., Assistant in Agronomy.
Karl Herman Fernow, B.S., Assistant in Plant Pathology.
Henry G. Good, B.S., Assistant in Entomology.
Olin Whitney Smith, B.S., Assistant Secretary.
Willard Waldo Ellis, A.B., LL.B., Librarian.
George Wilson Parker, Managing Clerk.

PRESIDENT'S LETTER OF TRANSMITTAL

September 28, 1923.

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Farms and Markets,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

And the Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said university shall expend such moneys and use such property of the state in administering said college of agriculture as above provided, and shall report to the commissioner of agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said college of agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the year 1922-23 of the New York State College of Agriculture and the Agricultural Experiment Station, signed by the Dean of that College and Director of the Experiment Station, Mr. Albert R. Mann.

The report deals with the large and varied activities in which the State College of Agriculture is engaged in the discharge of its legal responsibilities and the fulfillment of its educational obligations, with the problems which have arisen during the past year, and with the advances which have been made. It should be of very real interest to

persons who wish to be informed on the progress in agricultural science and education. It merits careful examination.

As a matter of special interest, attention is directed to the action of the Legislature of 1923 whereby the State Experiment Station at Geneva, with its history of distinguished service, was placed under the direction of Cornell University as the administrative agent of the State. The University cordially assumes the further responsibility which the State has placed upon it, and it welcomes the closer relationship which will thus be established between the State College of Agriculture and the State Experiment Station, because of their common interest in and legal obligations for the promotion of agricultural knowledge by means of experiment and research. Such an association of institutions with similar or identical powers is in line with sound public policy, and its value is fully attested by experience. The uniting of these two institutions is an important step in the development of New York's service to her agricultural interests. Usefulness and strength will be added to both the College and the Station as a consequence of the more intimate relation.

I wish again to urge upon the appropriate state authorities that provision be made for the speedy carrying-out of the building program of the College, submitted to the Legislature in 1910, and at the request of the legislative financial committees revised and resubmitted in 1920. The need for large additions to the housing facilities of the College is acute. The efficiency of the present staff is greatly hampered by reason of critical lack of space for the necessary educational and investigational services. Wisdom and economy of effort alike urge the early erection of the needed structures.

At the same time, I desire to record here the appreciation of the Trustees of the University and the faculty of the College of the cordial and considerate treatment accorded the College by the Governor and the Legislature. While much remains to be done to improve the scale of salaries, to provide housing, and more fully to maintain the established departments and lines of work, the steady development of the College by the State has been most gratifying. The College is returning to the people every year many fold for the investments made in the institution. Its contributions to agricultural knowledge and practice are among the important influences making for permanent stability and prosperity of the agricultural population in the State and the Nation. I invite those who wish a fuller knowledge of its services to peruse this report.

Respectfully submitted,

LIVINGSTON FARRAND,
President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1922-23

June 30, 1923

To the President of the University:

Sir: I have the honor to submit herewith a report of the New York State College of Agriculture and of the Agricultural Experiment Station in connection therewith, for the fiscal year 1922-1923.

The merger with the New York Agricultural Experiment Station

The most important and far-reaching event of the past year was the passage of an act by the State Legislature by which the administration of the New York Agricultural Experiment Station at Geneva is vested in Cornell University as the agent of the State. The movement was inaugurated in the Legislature by the Honorable Daniel P. Witter, of Berkshire, Tioga County, Chairman of the Assembly Committee on Agriculture. It was recommended by Governor Smith in a message to the Legislature, and the Governor also aided in the passage of the bill. The history of this movement may be traced briefly, for purposes of public record.

At the outset it may be well to point out that in each of the States in the Union, with six exceptions, the state agricultural experiment station is located at the same place as, and is identified with, the state agricultural college, with resulting advantages to both because of the similarity of research functions. New York is one of the six exceptions. In the other five States some form of official relationship exists, and in four of them steps have been taken to consolidate the administrations of the separated institutions. With one exception, therefore, New York is the last of the States having separate stations to move toward administrative amalgamation. It is a source of gratification that when the matter came before the New York Legislature it was fully accomplished at once, and in a manner wholly satisfactory to the staffs of the two institutions.

Under the laws of the State, the New York Agricultural Experiment Station and the Cornell University Agricultural Experiment Station (established in connection with the State College of Agriculture) have identical functions in research. It has been entirely possible for these two stations to cover the same fields and to come into conflict or to incur wasteful duplication. That none of these evils have resulted is due to the fact that conferences have been held and agreements reached in determining lines of work, and good will and mutual respect have controlled where legal definition was both lacking and impossible. For forty years the stations have operated harmoniously and, we believe, efficiently. While this cordial relationship might have continued indefinitely, there was potential danger in the separateness, and there were frequent ques-

tionings as to whether undesirable duplications did not take place, since the public had no means of determining what lines of work might most properly be undertaken at one place or the other.

The staffs at the two institutions have long recognized that the interests of both, and the development of the agriculture of the State, would be furthered if in some way a formal administrative relationship could be established and yet the advantages growing out of the geographical separation be retained. Discussions of this possibility have been held by representatives of the two institutions for many years. The first formal proposal was outlined by Director W. H. Jordan, of the New York Agricultural Experiment Station, in his annual report for 1915, in which he suggested affiliation of the State Station and the State College, having in mind at the time that the two institutions would retain their autonomy under separate boards of control but would have certain legal interrelations which would tend to promote harmonious and efficient functioning. In 1920 a form of affiliation was established without resort to law, the trustees of the two institutions, acting within their powers, voting to approve reciprocal elections of members of the respective staffs to their institutions. Thus the Board of Control of the State Experiment Station elected to its staff certain members of the staff of the State College of Agriculture, without salaries and without required duties, and the Board of Trustees of Cornell University took reciprocal action. Later, in the two examinations of the work of the two institutions made in 1921 and 1922, respectively, by representatives of the State Board of Estimate and Control, the similarity of functions was noted, and recommendations were made that the two should be placed under a single administration.

The accomplishment of the merger has been effected with the hearty concurrence of the persons most concerned with, and best informed on the services of, the two institutions. The scientific staffs of the institutions were unanimous in their approval of the project. On February 8, 1923, the Board of Control of the State Experiment Station passed the following resolution:

Resolved, That the consensus of opinion of this Board is that we would look with favor upon the unifying of the Station and the State College of Agriculture, providing a plan can be worked out which will make for efficiency and economy and will safeguard the vital interests of this Station.

This action of the Board of Control was magnanimous, and it should be highly commended, involving, as it did, the Board's own elimination from the control of a station which many of the members had long served, which they had brought to a place of high recognition, and to which they were warmly attached by many ties. It is somewhat unusual in the public service to find boards of control willing to voluntarily sacrifice their personal attachments and inclinations for what they believe to be the higher general good.

When informed of this action of the Board of Control of the Station and assured that the proposal met with favor on the part of the Station's scientific staff, the Agricultural College Council of the Board of Trustees

of Cornell University, on February 23, 1923, took the following action, which was subsequently affirmed by the full Board:

Resolved, That this Council approve the plan to place the administration of the New York Agricultural Experiment Station at Geneva under the control of Cornell University.

At the hearings on the measure held before the committees of the Legislature which had the bill in charge, the proposal was strongly indorsed by the State Commissioner of Education, the State Commissioner of Farms and Markets, the Master and the Secretary of the State Grange, the Secretary of the Dairymen's League, the President of the State Federation of Farm Bureau Associations, the President of the State Agricultural Society, the ex-President of the State Horticultural Society, and other persons.

The recent action by the State Legislature is the natural outcome of the discussions and actions of the past decade and earlier, and is the logical solution of the situation caused by the creation of two institutions vested with similar powers. The new law provides for the continuance of the State Agricultural Experiment Station in its present location and with its present powers, a provision that is altogether desirable because of the large equipment of the Station, its superior soil and climatic conditions for certain types of work (notably with fruits and vegetables), and its long and distinguished history and the place it holds in the affections of the people. The Station is not combined with the State College of Agriculture. It is placed under the control of Cornell University, the Trustees of which have the same powers in relation thereto as they have with reference to the State College of Agriculture. In order to effect the desired coordination of work, however, the trustees extended the jurisdiction of the Dean of the College of Agriculture to include also the administration of the State Experiment Station. The Dean then recommended that Dr. R. W. Thatcher, the Director of the State Station, be made Director of Experiment Stations under the Dean and be charged with the immediate administrative supervision of all agricultural research, including that at the State Experiment Station, at the Cornell University Experiment Station, and at the Long Island Vegetable Research Farm. The Trustees approved this recommendation. The members of the staff of the State Station were elected to the academic titles in Cornell University to which their equivalent status in the Station entitled them.

The principal advantages to be gained from the administrative consolidation of the work may be summarized as follows:

(1) The consolidation is in accord with the well-tested state and national policy that public institutions having closely similar or identical functions under the law should be administered by a single authority, in the interests of economy and efficiency.

(2) Responsibility is fixed to see that undesirable duplication and waste, and conflict of interest, are avoided. Hitherto either institution had a legal right to preempt the entire field, and the State had no responsible agent to see that this was not done. With a single administrative authority the responsibility is placed. Experience in certain other States clearly shows the importance of this.

(3) Better cooperation and coordination of work will be effected.

(4) There is made available to the State Experiment Station the large agricultural extension service developed by the State College of Agriculture in cooperation with the United States Department of Agriculture, including the county agent system. The State Station has needed machinery for getting its findings out to the people more fully.

(5) There are made available to the State Station the privileges and advantages of a great university, including its libraries, its laboratory, its equipment, and the opportunities for consultations with eminent authorities in many of the sciences fundamental to agricultural research, as well as with scientists engaged in many fields of agricultural research.

(6) There are made available to the State College of Agriculture the facilities of the State Station, and its superior soil and climatic conditions for certain lines of plant study, as well as the more intimate association with its large and able scientific staff.

The New York Agricultural Experiment Station comprises a farm of approximately 218 acres of excellent land, located at Geneva. In addition it rents 22 acres at Geneva, and leases a 10-acre orchard near Rochester, a 22-acre vineyard at Urbana, and a 28-acre vineyard at Fredonia, for experimental purposes. The 1923 Legislature provided for the lease of a tract in the Hudson River Valley for experimental work with fruit. The Station has an excellent equipment of administration, laboratory, and service buildings, and residences for the Director and for the chiefs in research. It is in great need of a new horticultural building. The original investment in existing buildings approximates \$300,000. The scientific staff numbers nearly fifty persons, in addition to the necessary staff for administration and operating services. Research divisions of agronomy, bacteriology, biochemistry, botany, chemistry, dairying, entomology, horticulture, and poultry husbandry, are maintained. The state appropriation for salaries and operating expenses for the year 1923-24 is \$229,735.

Other enactments by the Legislature of 1923

The College has again received considerate treatment from the Legislature and the Governor. While in certain respects—namely, in the general salary scale for teachers and in certain of the funds for general operation—the College is severely limited, nevertheless the State has consistently strengthened the College and has steadily built it to large dimensions with many strong departments. The generosity of the State merits full recognition.

The Legislature of 1923 made a gross appropriation of \$1,929,128.39 for the State College of Agriculture. Of this amount, \$500,000 was to continue the building program; \$15,000 was for walks, grading, and grounds; \$27,000 was a deficiency appropriation for fuel for the current year; and \$63,400 was a transfer of funds hitherto appropriated to the Department of Farms and Markets for contributions to the county agricultural and home demonstration agent system, now wholly administered by the State College in accordance with the law as amended at the 1922 session of the Legislature. There was included, also, a contingency appropriation of \$10,023.39, to reimburse the University for judgment

paid in the settlement of claims growing out of an automobile accident in September of 1917 in which the College was involved.

The appropriations provided approximately \$25,000 for increases in salaries, and approximately \$41,000 for new positions, more than half of which were necessitated by the new lines of work and the needs in the great new building for the Department of Dairy Industry. Among the more important of the new positions provided are a professorship and an assistant professorship in dairy bacteriology, a research professorship in dairy chemistry, an extension professorship in dairy industry, an assistant professorship in economic botany, an assistant professorship in rural social organization, and two assistant professorships in home economics. A number of other greatly needed minor positions were provided also.

Of special interest is the resumption of the building program inaugurated by the Legislature of 1920, when an authorization for construction in the amount of \$3,000,000 was given and an appropriation of \$500,000 was made, on the basis of which the new dairy industry building was erected. No additional construction was authorized during 1921 and 1922, although the Legislature of 1922 appropriated \$183,000 to apply on equipment for the dairy building and \$15,000 to equip the cold-storage building for fruit. On the recommendation of the Governor, the Legislature of 1923 specifically authorized the resumption of the building program inaugurated in 1920, and appropriated an amount, \$500,000, which it was estimated would cover the expenditures for the first year on additional buildings, notably the plant industry building and the library. The College first asked for a plant industry building in 1910, and the assurance of its realization now, after thirteen years of waiting, promises great relief at a point of very special restriction in our work. Our plant departments are handicapped almost beyond description in their present quarters, and are occupying space greatly needed by other departments. The staff as a whole is particularly grateful for this action of the Governor and the Legislature.

The bill to designate the School of Home Economics in the College of Agriculture as the State College of Home Economics was again introduced in both houses. Hearings were held on it before the Committee on Ways and Means in the Assembly, and the Committee on Education in the Senate. The latter Committee reported it favorably, but it was not brought to a vote. The hearings were attended by representatives of many of the women's organizations of the State, representatives of the State Department of Education, and others. The bill received able and strong indorsement from these representatives, and its merits were well established. It should receive legislative sanction by early enactment. It is clearly in the highest interest of the work which the State is supporting. No valid argument has been advanced against it.

The Legislature of 1923 passed an act more clearly defining the functions of the six state schools of agriculture of secondary grade, and establishing their relationship to the State Department of Education. Under the terms of the law, the State Commissioner of Education, the State Commissioner of Farms and Markets, and the Dean of the State College of Agriculture, are made members of the boards of trustees of all of the schools.

The college library

During the year there have been added to the college library 4938 volumes. The use of the library has constantly grown, despite its scattered and wholly unsuitable and inadequate housing. Records show that during the academic year 1921-22 its use increased 50 per cent over the year preceding, and during 1922-23 there was a further increase of 30 per cent over the year 1921-22.

The limitations of space, and the fire and water hazards surrounding the library, are extremely serious. The main college library can hold only a part of the books, and the remainder are scattered among many of the departments, greatly reducing the efficiency of operation. Many books and pamphlets have had to be stored where they are wholly inaccessible. The crowded conditions in the central library had become so acute that last spring the State Architect, fearing for the safety of the building and its occupants, summarily ordered the removal of a large number of books on the second floor. There were removed to the Farm Management Building 3500 volumes. An equal number of volumes were already housed in that building because of inability of the central college library to take care of them, and there they are piled on shelves to a height of fourteen feet, making their use most difficult. The Farm Management Building is entirely of wood construction except the bearing walls, and it is a wholly unsafe place for these collections. But there was no alternative. The need for a new, adequate, fireproof library building is of outstanding importance.

Land and building acquisitions

During the year the Board of Trustees purchased, for the purposes of the College, 46 acres of the Barrett-Snyder farm immediately adjoining the holdings of the University to the east. This is a level tract of good land, and is a desirable addition to the area under the administration of the College.

A combination tool and straw barn, for use by the Departments of Poultry Husbandry and Grounds, was erected in the past year.

The new building for dairy industry was brought to substantial completion during the year. The new equipment was ordered in the fall, and the end of the year found much of it on hand and work rapidly under way for its installation. The building, when fully equipped, will be a great addition to the facilities for the promotion of the dairy industry, not only in New York but also in the Nation. It has no equal among buildings for the same purpose at any other institution in the United States. The responsibility of the College to render service to the dairy interests is more deeply realized with the provisions of such ample accommodations.

In the report for 1922, attention was called to the bill passed by the Legislature of that year making appropriations for the establishment of a vegetable research farm on Long Island. The bill carried \$10,000 for the purchase of land, and \$16,200 for the erection of buildings. Fortunately, however, a farm with the desired buildings was located and purchased last summer. It was known locally as the Homan farm, and is

situated four miles north of Riverhead, on the North Road. It contains 30 acres of almost ideal land for vegetable experimental work. The buildings include a large dwelling-house of eleven rooms, which has been made into a two-family house; a new and smaller dwelling of seven rooms, which with slight alteration is serving admirably as a laboratory and office building for the three investigators now working at the station; a comparatively new greenhouse 41 by 100 feet in area; a smaller greenhouse 34 by 55 feet in area; a good barn; and several small buildings. The purchase price was \$24,000, and the farm provides much better facilities than could possibly have been obtained had the land been purchased without buildings. The present buildings could not now be erected short of a cost far in excess of the \$16,200 provided for construction. The opinion of the Attorney General, holding that the appropriation could be used for the purchase of a farm with buildings erected, was advantageous to the State and to the projected work. The vegetable research specialist, Professor P. H. Wessels, assumed charge on September 1, 1922, and the two investigators under the administration of the State Experiment Station, Doctors Clayton and Hockett, began work last summer. The present year will see the experimental work well under way.

Special temporary fellowships and other grants

On January 6, 1912, the Agricultural College Council of the Board of Trustees passed the following resolution: "The Director (of the College) shall have power, subject to approval of the University Attorney as to form of instruments, to make contracts for the establishment of industrial fellowships * * * same to be reported at the next meeting of the Council." Since that time more than threescore such temporary fellowships have been established, and they have been productive of many highly important advances in knowledge, as well as provided financial assistance to many graduate students. Because of the responsibility which the Graduate School has for the award of fellowships for graduate study, the Trustees, on the recommendation of the Dean of the College, on November 18, 1922, amended the foregoing resolution so as to provide for the concurrence of the Dean of the Graduate School in the acceptance of grants for such fellowships and make him a party to their execution.

During the year covered by this report, the following special temporary fellowships have been established:

(1) By the Western New York Fruit Growers' Cooperative Packing Association, a grant of \$750 for one year, for the purpose of studying the cost of assembling, grading, and packing fruit in central packing houses.

(2) By the International Milk Dealers' Association, a grant of \$600 for one year for the purpose of studying problems in the production and handling of clean milk and the manufacture of dairy products.

(3) By the Williamson Cooperative Vegetable Growers' Association, the reestablishment of a fellowship carrying \$1250 a year for two years for the purpose of investigating and demonstrating the nature and control of diseases and insect pests injurious to muck crops.

In order to cover the costs of inspections of poultry flocks for the purpose of certification, the New York State Cooperative Poultry Certification Association has deposited with the Treasurer of the University \$2000. The Association of New York Cannerymen has made a grant of \$750 to pay the expense of an intensive survey of the crop-production problems in the canning industry, one of the important agricultural industries of New York. These two last-named grants are not identified with graduate study.

Since 1917, the New York State Bankers' Association has cooperated most helpfully with the State College of Agriculture in the promoting of junior extension, or boys' and girls' club work. In 1917, and each year since, the association has provided annually an average of 10,000 achievement emblems, or pins, which have been awarded to girls and boys who have completed their junior extension projects. These emblems have done much to create and sustain interest in the work on the part of the young people. Other grants have been made by the association and by individual members and banks. Two years ago, five members of the association each gave \$200 to be used to defray the expenses of junior workers who had done notable work, for attendance on the winter courses at the State College. A year ago the association appropriated \$1000 for the same purpose. At its recent meeting, the association again provided for the achievement emblems and appropriated \$1000 for five equal scholarships, to be applied, at the discretion of the Dean of the College, to the expenses of winners for either a long or a short course at the State College, or for attendance at one of the secondary state schools of agriculture. These grants have been eagerly sought by club workers. Grateful acknowledgment is made to the State Bankers' Association for this substantial evidence of their interest in the work.

The New York State Grange has continued its authorization of twelve scholarships of a value of \$50 each, and the *American Agriculturist* has renewed its scholarship of \$200 offered for the first time a year ago. There is ample evidence that such scholarships encourage young persons to study agriculture who otherwise would feel that they could not afford to do so. The College is indeed glad to have such grants available.

Changes in the college staff

During the year the following changes in staff occurred: On July 1, 1922, Dr. Olney B. Kent, Professor of Poultry Husbandry, and H. E. Babcock, Professor of Marketing, resigned to accept desirable posts in the commercial field. On February 1, 1923, G. R. Hoerner, Extension Assistant Professor of Plant Pathology, who had held that position for three terms, resigned to accept a position in commercial work. At the close of the year, Dr. W. H. Chandler, Professor of Pomology and Vice Director of Research, tendered his resignation in order to accept appointment to a research professorship at the University of California. By his personal scientific contributions and his able administration of his office, he had served the College, the State, and his field of knowledge most acceptably and productively, and his influence will long be felt. Other resignations at the close of the year include those of Dr. O. G.

Brim and Miss Emma Johnson, of the Department of Rural Education. Dr. Brim went to the Ohio State University, and Miss Johnson entered commercial work.

Effective on October 1, 1922, Mr. F. O. Underwood, a graduate of the College and a successful county agricultural agent in Nassau County, New York, was appointed Extension Assistant Professor of Vegetable Gardening. On the same date Howard B. Meek, a graduate of Boston University and holding the degree of master of arts from Yale University, was appointed Assistant Professor of Institutional Management on funds provided by the American Hotel Association for the inauguration of special courses in hotel and institutional management. Funds provided by this association made possible also the appointment, effective on June 1, 1923, of Frank H. Randolph, B. A. (Yale, 1915), M. E. (Cornell, 1917), as Assistant Professor of Institutional Engineering. Also on June 1, Mr. E. F. Guba, a graduate of Massachusetts Agricultural College and holding the degree of doctor of philosophy from the University of Illinois, assumed his duties as Extension Assistant Professor of Plant Pathology. Walter Conrad Muenscher, Ph.D. (Cornell), has been appointed Assistant Professor of Economic Botany, effective on July 1.

Attendance of faculty members at meetings of professional societies

The desirability that members of the faculty should be encouraged and enabled to attend the meetings of professional societies in the fields of their specialties, needs no argument. Probably the greatest bar to the more general attendance is the cost, in view of the inadequate salaries of teachers. In order to suggest an equitable and practicable basis of contribution by the College to the travel expenses of members of the staff who may desire to attend such meetings for professional improvement, the Dean appointed a committee of the faculty, which drafted the following report. It was approved by the faculty, and was subsequently accepted in principle by the Board of Trustees.

In accordance with your request, the committee appointed by you has prepared a list of professional societies, the meetings of which members of this faculty may desire to attend as a means of improving the work of their departments. The list may not be complete, and new societies will be formed. It is recommended that additions be made to it by the Dean upon the recommendation of any member of the faculty.

1. Your committee recommends that, when funds can be spared without injury to the work of the College, the privilege of having part of the necessary railway and sleeping-car fares paid by the College be granted, once a year, to each professor and assistant professor, for attendance at a meeting of one of these societies.

2. It is recommended that at the beginning of the fiscal year the Dean decide upon the amount of aid that will be given by the College to any member of the faculty who wishes to attend such a meeting, and that this amount be the same for all members of the faculty regardless of where the meetings are held, except with any meetings so near Ithaca that railway and sleeping-car fares will be less than the amount decided upon, when only such expenses should be allowed.

3. The committee further recommends that, until such a plan can be adopted for giving equal assistance to all members of the faculty in attending such meetings, no assistance from the College be given to any member of the faculty for such attendance.

4. The committee does not believe that any rule can be formulated for the attendance at meetings of semi-professional and commercial organizations at the expense of the College, there being much more urgent reasons for attendance at some than at others. It, therefore, recommends that attendance at these meetings be by special arrangement with the Dean in accordance with existing practice.

The contribution for the first year was fixed by the President and the Dean at \$15. The initial experience has shown that the plan is greatly appreciated by the members of the faculty, and that it will serve its intended purpose. It will be desirable to increase the amount of aid given when funds can be spared.

Summer instruction

On May 2, 1913, the Trustees approved a recommendation by Director L. H. Bailey, for the establishment of a third, or summer, term in agriculture, thus providing for the operation of the College throughout the year. The new term was inaugurated in 1914 and was continued until and including the summer of 1922. Owing chiefly to the difficulty of arranging a long term that would articulate with the regular terms of the usual academic year at Cornell and at other institutions, the project did not yield the results anticipated in its establishment, and, on recommendation of the faculty of the College on December 6, 1922, the Trustees approved of its discontinuance. If the University were ever to return to the trimester system, it is not unlikely that the faculty of this College would wish to consider the establishment of a fourth, or summer, quarter. The desirability of full summer instruction remains, even though it has been found impracticable under existing conditions.

Because of the large development of the fields of biological science at Cornell University, and because of the superior advantages offered by Ithaca and its environs for biological study and research, there was proposed, as a partial substitute for the former third term, the establishment of a summer term in biology. As the idea developed it became apparent that such a term, or school, should be broader in scope than the facilities of a single college afford, and the project was finally developed to include teachers from the Colleges of Agriculture, Arts and Sciences, Medicine, and Veterinary Medicine. A wide range of courses has been announced for the summer of 1923. The program should be highly attractive to persons desiring special study in the fields of biology.

The regular Summer School in Agriculture has continued its most satisfactory development, and for the current year it reached an enrollment of 992 persons. More than 400 of these were specializing in physical education. In order particularly to meet the requirements of teachers of physical education in the rural schools, courses were introduced into the Summer School some years ago at the suggestion of the State Department of Education. The enrollment has been surprisingly strong, and it has now reached such proportions that it seemed best to the College to seek to transfer the work to an institution that offers courses in physical education throughout the year, which the State College of Agriculture does not. The work requires a staff, now of considerable proportions, not required by the College for its regular instruction in

agriculture and home economics. Of special importance was a change in the requirement for certification of teachers of physical education which made it impossible for persons to prepare for this field solely by means of summer study. Accordingly, arrangements have been completed for the transfer of this work and the students concerned to the State Normal School at Cortland, effective for the summer of 1923. The College had experienced a high degree of satisfaction in the development of this instruction, and the determination to seek its transfer elsewhere was not made without a sense of sacrifice.

The most pressing need of the Summer School is such an increase in the appropriation for it as will permit the substantial doubling of the compensation now paid to the teachers. The present summer-school schedule is approximately 50 per cent of the standard rate recognized by institutions for summer-school instruction. The typical rate is one-sixth of the annual salary. Our summer schedule must be brought to this level speedily if we are to maintain the instruction in strength. We have experienced great difficulty in engaging a satisfactory staff on our present basis.

The enrollment of students

The complete enrollment of students in the College of Agriculture during the year 1922-23 is given below, in comparison with the figures for 1921-22:

	1921-22	1922-23
Freshmen	384	368
Sophomores	249	283
Juniors	269	230
Seniors	207	264
	<hr/>	<hr/>
	1,109	1,145
Special students	72	39
Winter-course students:		
Agriculture (General)	171	121
Dairy Industry	51	48
Poultry Husbandry	41	40
Fruit Growing	32	22
Flower Growing	28	16
Vegetable Gardening	6	7
Home Economics (not offered in either year) ...	...	...
	<hr/>	<hr/>
	329	254
Graduate students	250	189
Summer-school students	930	992
	<hr/>	<hr/>
	2,690	2,619
Less number counted twice.....	86	145
	<hr/>	<hr/>
	2,604	2,474
	<hr/> <hr/>	<hr/> <hr/>

The number of regular students enrolled in 1922-23 was reduced by reason of the transfer, at the close of the preceding academic year, of the instruction in landscape art to the College of Architecture, involving a transfer of approximately 38 students from the College of Agriculture.

The Durand collection

The College is extremely fortunate in having obtained, during the year, the herbarium and library of the late Dr. Elias J. Durand, Chairman of the Department of Botany of the University of Minnesota. As Dr. Durand was for fifteen years a prominent member of the Department of Botany at Cornell University, it is particularly fitting that his collections and books should come to this institution. The herbarium contains over 12,000 specimens of Discomycetes, a group of fungi in connection with which Dr. Durand held an international reputation. This is regarded as the finest and most complete collection of its kind in existence. It is fully indexed, and is accompanied by thousands of sheets of manuscript notes which represent Dr. Durand's memoranda of his personal studies of the specimens. The collection includes, also, 6000 prepared slides bearing mounts for microscopic study. The library consists of 2240 bound separates, an approximately equal number of unbound separates, and nearly two hundred books. These separates and books are chiefly mycological in nature, and embrace many rare works on the Discomycetes.

Since many of the fungi which cause disease in plants belong to this group, the acquisition of this herbarium and library is of the utmost importance to the work in mycology and plant pathology. Moreover, their location here gives added prestige to the mycological work in this institution. Graduate students and specialists on these fungi in other institutions will doubtless be attracted by the more favorable opportunity for research in these fields which is now presented at Cornell University.

Dr. Bernhard Eduard Fernow

In the report for 1922, attention was called to the action of the Board of Trustees in naming the forestry building Fernow Hall, in recognition of the great services to forestry rendered by Dr. B. E. Fernow, the first Director of the New York State College of Forestry at Cornell University. In that report reference was made to his life and his work. On October 5, 1922, a suitable tablet over the entrance to the Hall was unveiled.

On February 6, 1923, Dr. Fernow died at Toronto, full of years and with a record of distinguished public service to both the United States and Canada. His name and his work will remain outstanding in the early history of the profession of forestry in America. It is an occasion for some satisfaction that Cornell University's particular recognition of his great work came when he could know of the honor and derive such pleasure as may arise from the knowledge that one's name is thus perpetuated in the University and the State where he served. It lightened the shadow of the increasing infirmity of his latter days.

Departmental notes

Agricultural Chemistry. The transfer of the Department of Agricultural Chemistry from the College of Agriculture to the College of Arts and Sciences, concerning which reference has been made in earlier reports, was finally consummated with the close of the academic year 1922-23. This department long occupied a conspicuous place in th

work and organization of the College of Agriculture, and its transference, as an adjustment to improved university organization, is not without real loss and sacrifice to the College. The retention of seats on the faculty of Agriculture by the teachers thus transferred will be helpful in safeguarding the educational interest which this faculty still has in the work in agricultural chemistry.

Professor F. E. Rice was on sabbatic leave during the second term and devoted his time to the study of problems relating to the chemistry of milk. Professor Cavanaugh carried forward the investigation on the effect of the spray process of drying milk on vitamine C, an investigation made under a grant from the Merrill-Soule Company, of Syracuse. A preliminary report of this work has recently been published.

Agricultural Economics and Farm Management. The large volume of teaching done by the Department of Agricultural Economics and Farm Management is indicated by the registration of 913 students in the four-years course, the Summer School, and the winter course. There were in addition 70 graduate students taking major or minor work in this department.

While the main emphasis of the teaching is on preparation for farming and for agricultural teaching, the department reports an increasing demand for instruction on the part of those who plan to go into lines of business with which the farmer comes into contact (such as dealing in feeds, fertilizers, and farm machinery, country banking, country store-keeping, and the like, whose practitioners are in a position to have an important influence on the agriculture of the region), and, more particularly, from those who have to do with the problems of marketing farm products. With the congestion of population, the problems of handling and distributing farm products are becoming increasingly acute. Trained men are needed in these occupations. A knowledge of agriculture, marketing, and business methods is necessary if good progress is to be made in the solution of the marketing problems. The time seems to have arrived when courses designed to prepare students for such occupations should be arranged. Most of the necessary subjects are already taught, but a few new courses and a regrouping of old ones are now desirable.

Animal Husbandry. The Department of Animal Husbandry reports distinct progress in its work resulting from the appointment of Dr. H. J. Metzger as Extension Veterinarian, from the appointment of an analyst to facilitate the research in animal nutrition, and from changes made in the laboratory facilities. The department is in urgent need of a calf barn, a sheep barn, and a beef-cattle barn.

Botany. The herbarium of the Department of Botany has acquired, besides miscellaneous specimens, 1600 southwestern plants collected by Mrs. K. M. Wiegand and Professor G. B. Upton, 465 Texas plants collected by Albert Ruth, 900 New York plants collected by members of the staff, 3000 specimens of mosses from the herbarium of J. K. Small, and 1300 plants from Virginia and North Carolina collected by Dr. L. F. Randolph. The transference of the herbarium from the former Department of Botany in the College of Arts and Sciences has made a most notable and comprehensive addition to the teaching facilities of

the department, and the pressing immediate need is for space in which the collections can be consolidated. The constant and necessary growth of the herbarium calls for increased facilities for its proper care.

During the year the department has instructed 847 undergraduate students. Of graduate students, 26 have taken their major work and 40 their minor work in this department.

The granting of seats in the faculty of Arts and Sciences to six members of the staff of the Department of Botany marks a distinct gain in university organization. The common interests of the two Colleges in the botanical work will be furthered by the arrangement. Consideration could well be given to the extension of this policy to certain other lines in which the educational interests of the faculties come close together.

A very important addition to the staff was the appointment of an assistant professor to deal with the problems of weed eradication and the plants poisonous to livestock. The College has felt the need for such a specialist for many years, but it was not until the position was created at the past legislative session that the appointment became a possibility.

Dairy Industry. The most immediate expansion in instruction resulting from the enlarged facilities of the Department of Dairy Industry will be additional work in connection with condensed and powdered milk, in the manufacture of fancy cheeses, and in dairy chemistry and bacteriology. At the same time, the instruction will be strengthened in every one of its phases. Perhaps most important of all is the provision which the new building affords for graduate study and staff research. The former quarters and equipment of this department were altogether inadequate for every phase of the work. The staff has eagerly anticipated the facilities which the new structure affords.

Entomology. The Department of Entomology, Limnology, and Ornithology gave instruction to 940 students. These included 81 graduates, of whom about 40 were taking their major work in the fields of the department.

During the year there has been a mutually satisfactory helpful exchange of positions between Professor Needham, of this department, and Professor W. A. Hilton, of Pomona College.

Extension Teaching. Courses 1 and 2 in Extension Teaching give training in oral and written expression, the subject matter used being largely agricultural. An advanced course, to be added in the coming year, will use material appropriate in the training of county agents, junior club leaders, and extension specialists. The courses given during the year had an enrollment of 187 students.

Farm Practice. The Office of Farm Practice is responsible for determining the amount of farm experience of entering students, and for helping to provide such experience for those who are deficient in it. Of new students entering during the year, 26 per cent were classified as having had no farm experience, and 23.2 per cent as having already had the required amount. In the intermediate group, 36.5 per cent had had less than half, and 14 per cent more than half, of the total amount required before the student enters his senior year. Besides helping students find opportunity for farm work, the Office of Farm Practice

supervises the students placed in such positions, and incidentally gives such aid as is possible to persons who desire farm help.

The effort to get into touch with graduates of the College and to learn their present occupations has been prosecuted with vigor. One or more letters have been written to each of the 5601 graduates whose addresses were obtainable, and 4730 have replied. The study of the occupations of these former students is yielding much interesting and valuable information.

Floriculture. During the year the floricultural test gardens, which have long been located on what is known as Craig Field, were removed to an area known as Field No. 9, on the state highway beyond Forest Home. The change was made chiefly because of more suitable soil conditions, but also because of the greater accessibility of the new location. In the new area the grounds will be enjoyed by much larger numbers of persons, and the investigational work will be advantaged by the more suitable land. Funds are greatly needed for the development of the tract and for suitable service buildings.

Forestry. A pressing need of the College continues to be for a forest tract of approximately 2000 acres. Such an area is urgently required for instructional and investigational purposes. Both graduate and undergraduate students would be benefited by an opportunity to take part in active forest-management work, and to engage in investigative projects involving mensuration, protection, or silviculture. Last December the representative of the unnamed donor who has recently given \$100,000 each to Harvard and to Yale for research in forestry, made tentative inquiries concerning research in forestry at Cornell. One of his first questions was, "Is there a college forest where experiments running over a long period of years can be carried on, secure against interruptions?" The lack of such a college forest is a constant handicap to the department. Such a tract should be provided either by the State or by private gift.

Home Economics. The first year in the new course in the School of Home Economics designed to prepare for hotel administration showed very satisfactory results. The schedule of courses is rapidly being organized, courses previously in operation have been adapted to the needs of a new group of students, and staff members have undertaken special preparation for the new phases of their work. The course has attracted wide interest, and a total of 37 students were enrolled during the past year. The American Hotel Association has generously increased its support of the course.

The total number of students receiving instruction in the School of Home Economics during the year was 487, of whom 144 were in the Summer School and 38 were special students or students from other colleges in the University; the remainder were students taking the regular four-years course in home economics.

Miss Flora Rose, Professor of Home Economics, was granted leave of absence from April 1 to September 30, 1923, in order to accept appointment to conduct extensive nutritional studies in Belgium under the Educational Foundation of the Commission for Relief in Belgium. The

work promises to be of much importance to the efforts which the Commission is making to place on a scientific basis its service to the children of Belgium. During the summer of 1923 Miss Rose will be joined by Professor Martha Van Rensselaer, whom the Commission has also engaged for studies in another phase of its health work.

Meteorology. The demand for work in the Department of Meteorology, particularly in the elementary course, has continued so heavy that not all applicants could be accommodated. A shift in laboratory space assigned for next year will probably remedy this situation. The department has continued its research on the correlation of weather factors and crop yields. An interesting study is also under way on the variation of rainfall and temperature over limited areas of the university farms.

Plant Pathology. The Department of Plant Pathology has, as always, given instruction to as many students as could be accommodated in its inadequate laboratories. Of graduate students taking major or minor work in the department there were 35, and of undergraduates 82. Although admission was allowed beyond the reasonable limits of the facilities, 19 students, mostly seniors, had to be excluded from the courses, and so must complete their college work without instruction in this highly important field.

Pomology. The registration in the Department of Pomology for the year included 155 undergraduates, 14 graduates doing major or minor work, and 63 winter-course students. The department has for two years consolidated the teaching of each member of the staff as largely as possible in one term, allowing each teacher to concentrate on research during the other term. This has worked to decided advantage, but increasing registration would make the plan impossible. When instructors have contact with the practical problems and the investigational work, the tendency in the teaching is to emphasize a critical and research point of view. This attitude toward the subject should ultimately be of the greatest practical and lasting value to the student who desires a university education and who will not be satisfied with mere platitudes.

The field laboratory of the department has been augmented by additional plantings of young orchards, and especially by a collection of all varieties of the hardier nut species. The new packing shed also has become available for instructional purposes during the year.

This department suffers even more than do the others through the resignation of Professor Chandler, who conducted his research and some teaching in pomology in connection with his administrative duties as Vice Director of Research.

Poultry Husbandry. The Department of Poultry Husbandry had 167 students registered in its four-years courses in the past winter. There were 40 students in the professional winter course in poultry, and 74 in the other winter courses given in the department. The Annual Judging School of one week duration conducted by the department continues to meet with great appreciation. This year the school was attended by 126 persons, of whom 30 were from outside New York State; and 35 counties of the State were represented in the school.

Rural Education. With the omission of the third term, the Department of Rural Education has rearranged its teaching schedule so as to include two courses to be offered to members of the teaching staff. The need and the desire of an opportunity for professional improvement on the part of staff members have been recognized for some time. The present beginning in this direction consists of two courses, one in Educational Psychology in the first term and one on Problems of Agricultural College Teaching in the second term.

The work on the survey of the rural schools of the State, the most comprehensive study of its kind, in which several members of the department shared in important ways, was completed during the year with the publication of an eight-volume report.

Rural Engineering. The Department of Rural Engineering has gained greatly in the effectiveness of its work by its transfer to the building heretofore occupied by the Department of Landscape Art. The staff has been increased by the addition of Assistant Professor F. H. Randolph, who will organize the special work in engineering for students of hotel management, on funds provided by the American Hotel Association.

Rural Social Organization. The work of the comparatively new Department of Rural Social Organization has progressed satisfactorily, with increased undergraduate enrollment. The graduate work is hampered by the lack of opportunity for taking courses in general sociology in the University. The need of students specializing in this field for a good foundation in sociology is obvious, and the development of that subject by the University would be greatly appreciated.

Vegetable Gardening. The Department of Vegetable Gardening gave instruction to 164 students during the year, 6 of whom were candidates for advanced degrees. This registration, while it is the largest to date, is not yet commensurate with the importance of the vegetable gardening industry in New York, and it has been impossible to fill the requests for recommendations of graduates for positions open in this field.

THE RESEARCH ACTIVITIES THE AGRICULTURAL EXPERIMENT STATION AT ITHACA

The rising demands of farmers, the increasing complexity of the food problems, and the very progress of knowledge itself, all combine to urge the necessity for a greater volume of well-directed agricultural research in ever-widening ranges, and its prosecution by men of the best scientific training. A college of agriculture which seeks to serve the whole field of agricultural endeavor and of country life, must constantly maintain a highly developed organization for agricultural investigation. Many of the problems may not seem at the moment to be of apparent value to the industry, but their value cannot be so judged; they are likely to be the next important steps in a chain of evidence which must be built up before the case will be complete or the solution of a given problem or problems will be possible. The capable investigator is likely to be the best judge of the necessity for the studies which he undertakes. The accumulating body of knowledge, the product of many widely scattered, painstaking

investigators, is the most dependable guarantee that reliable progress shall be forthcoming.

We record here, by name or condensed summary, such investigations conducted by members of the staff as have matured during the past year to the point of publication. They are indicative of the scope and character of the work being done by the experiment station.

The investigation of bean production

A research activity which is proving to be of great importance to an industry in the State is the bean investigation, maintained on a special grant by the Legislature, beginning in 1917. Due to competition with other producing sections and to serious losses from diseases and insects, bean growing had become unprofitable and the industry had seriously declined from its once important place in the agriculture of the State.

On funds provided by the Legislature, three investigators were employed and a laboratory was equipped at Perry in 1917. Extensive studies have since been made concerning the nature and the means of control of several diseases and of the insect and other animal pests of beans. As a partial result, the College has published three memoirs: Memoir 26, *The Dry Root-Rot of the Bean*; Memoir 42, *Bean Anthracnose*; and Memoir 55, *Insects and Other Animal Pests Injurious to Field Beans in New York*. Technical papers have been published also in journals, notably the following: *Inheritance of Disease Resistance in the Common Bean*, in the Journal of the American Society of Agronomy, volume 13, pages 15 to 32, 1921; and *The Bacterial Blight of the Bean; a Systemic Disease*, in Phytopathology, volume 11, pages 61 to 69, 1921. The knowledge gained as a result of these studies has been summarized for the farmers of the State in Extension Bulletin 58, *Diseases, and Insect and Animal Pests, of the Field Bean in New York*.

Efforts have also been made to find and to breed varieties resistant to the more destructive diseases. Fortunately there has recently been originated in Michigan a very productive new variety, the Robust. Tests made by the College have shown that this variety is immune to the mosaic disease and is fairly resistant to the bacterial blight. As a result of these studies this variety is being grown extensively, and the Pea-bean industry seems now to be making substantial gains. It is reported that the acreage of Pea beans in New York is greater this year than it has been for a decade, and that in nearly all of this acreage the variety planted is Robust.

In the breeding work, strains have been developed by the College that are very promising as to productivity and as to resistance to anthracnose. An anthracnose-resistant Marrow bean known as the *Perry Marrow* is being grown in a small way by some farmers and is being propagated by several seed houses. Other strains that seem to be very productive are resistant to mosaic or to root rot. These are being tested further and it is not yet certain whether or not they will be considered worthy of introduction. An effort is being made, by crossing resistant strains, to establish a productive variety that will be resistant to all important diseases, but none has been evolved as yet. In the case of some of the dis

eases, particularly anthracnose, a strain may be resistant to the disease in the form in which it prevails in one section and not in another. Thus very long and careful trials are necessary before a strain should be named and introduced as a disease-resistant variety. However, the progress which has been made during so few years suggests that great benefit to the State may result from the work in breeding beans and other crops for disease resistance.

Studies in fish culture

For many years the College has been at work on the problems of fish culture as a phase of its biological research, having as an object the development of fish raising as a farm industry on the many thousands of square miles of fresh water in streams, ponds, and lakes within the State. A bulletin and other reports on the progress of the work have been published. The results of the studies have been most encouraging. There is here involved a field of great economic importance to the State.

The College has received from the United States Bureau of Fisheries, without cost, a selection of fishes from the Middle West to replace those lost in the flood of August, 1922. The Conservation Commission of New York State has generously donated several pairs of rainbow-trout breeders and of the large Chautauqua Lake bullheads. These contributions were most welcome and are gratefully acknowledged. So far as stock fish are concerned, the College is now sufficiently supplied for all immediate purposes. If a fund of \$5000 could be provided for facilities, the work would be very greatly furthered and results assured for practical application throughout the State.

The following investigations bearing upon fish life and fish culture have been continued during the past year:

(1) A study of the habits, growth, and economy of the common sucker, *Catostomus commersoni*. Although this is a widely distributed species, it has been somewhat neglected by students of fish life. It is important that we should know what relation this species bears to other fishes and to its surroundings. This work is expected to clear up many perplexing questions in regard to these matters, and to further the investigations relating to other species.

(2) A study of the activities of the common bullhead, a popular food fish of wide distribution, begun in 1921. The object is to determine the breeding habits, the food, and the variation in rate of growth, of this species. Certain facts have been established which will aid materially in devising proper methods for propagating this fish on a commercial scale. Unfortunately the work was seriously disturbed by the loss of practically all selected age groups in the flood of August, 1922. Inadequate funds had made it impossible to properly protect the breeding ponds against flood conditions.

This study constitutes a phase of a larger problem under investigation, that of developing a rapid-growing, well-flavored fish which may be propagated commercially by any farmer having average aquatic resources—a fish, in short, which may be grown and marketed as easily as is the carp in Europe, but one possessing a much superior flavor. Other fishes which are being studied with the same end in view are the channel cat-

fish, the buffalo fish, the blue-gill sunfish, the crappie, the calico bass, and the black bass.

With our very limited pond development it is necessary to keep several species together in the same pond. Under such conditions the mortality among the young is very high because of cannibalism, which hampers the work to a marked degree.

A very important requirement of successful work consists in selecting the most vigorous and rapid-growing individuals of each species and isolating them in separate ponds. It has been possible to do this in the case of only one species, due to a lack of rearing ponds. We have ample water supply and an adequate area for the development of a sufficient number of ponds, but the work is retarded by lack of funds for building them.

(3) A continuation of the investigations leading to the development of a strain of trout resistant to higher water temperatures than are normal to wild fish. It has been demonstrated that about two per cent of the young from normal rainbow-trout breeders will successfully withstand temperatures as high as 82° F. The College has been unable, however, to retain these few young fishes because the water temperatures in the hatchery range above 85° F. for a short period in summer. For the same reason it has been impossible to retain, during the summer, trout breeders from which successive broods of young might be derived for experimental purposes.

After experimenting for two summers with small underground basins, it has been demonstrated beyond a doubt that a large underground concrete tank will deliver the required amount of water at a suitable temperature throughout the summer. Such a basin, together with piping to the trout ponds, can be constructed for about \$1200. With this provision we would be able to continue the selective breeding experiments not only with trout but likewise with many other fishes, the work with which was discontinued because of unsuitable water temperatures. A basin that cools water in summer will raise the water temperature a few degrees in winter. Consequently the winter work at the hatchery would be facilitated to a marked degree by the construction referred to. The situation will be met in part for summer conditions by piping water from an available spring.

(4) A study of the effects of temperature on the development of trout eggs, started in 1916. This has been continued each winter and early spring when conditions were suitable, and it is hoped that definite conclusions may be derived in the near future.

(5) Experiments relating to the production of natural fish-food organisms by the use of various fertilizers. There are strong indications that certain organisms may be produced in great numbers by this means. As in the case of domesticated animals, it is becoming evident that artificial food may be used to greater advantage when there is available a certain amount of natural food. Growth is more rapid, there is greater resistance to infectious diseases, and food-deficiency diseases, no longer occur. Therefore, if it becomes possible to propagate natural food in large quantities and with economy, one of the greatest drawbacks to intensive trout culture will have been eliminated.

Bulletins and papers published during the year

In the following pages a brief report is made of the research activities of the different departments, in so far as the work has been developed to the stage of publication.

Agricultural Chemistry

In the Department of Agricultural Chemistry the following papers have been published:

Frank E. Rice and Arthur J. Rider — Simplified apparatus and technique for the electrometric determination of hydrogen ion concentration in milk and other biological liquids. Cornell Univ. Agr. Exp. Sta. Memoir 66. 1923.

In this work an investigation was made of the influence exerted by various factors upon the speed and the accuracy of the determination of hydrogen ion concentration. With the knowledge thus gained, an apparatus was designed which is simple of construction and easy and rapid of manipulation. The new procedure is a distinct advance over previously used methods in the following particular respects: (1) Several hydrogen electrodes can be checked against one another, as well as several calomel cells, without adding to the complexity of the apparatus. (2) Determinations can be made continuously on a given sample, without the necessity of replacing the liquid with a fresh portion. (3) A simple means of temperature control is suggested. The apparatus is well adapted for use in student laboratories as well as in research work, and it can be used also for electro-titrations.

The following papers are ready for publication:

F. E. Rice and P. A. Downs — Sweetened condensed milk.
Bacterial thickening.

F. E. Rice and J. Miscall — Copper in dairy products, and its solution in milk under various conditions.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management the following papers have been published:

J. E. Boyle — Chicago wheat prices for eighty-one years — Daily, monthly, and yearly fluctuations and their causes. Published privately. 71 pages.

E. G. Misner — Relation of the composition of rations on some New York dairy farms to the economics of milk production. Cornell Univ. Agr. Exp. Sta. Memoir 64. 1923.

This memoir reports and discusses the correlations existing between narrowness of the winter ration, season of freshening, size of herd, weight of cows, and yield per cow, respectively, and cost of milk production.

E. G. Misner — Economic studies of dairy farming in New York. I. Condensery milk without cash crops. Cornell Univ. Agr. Exp. Sta. Bul. 421. 1923.

This bulletin describes some of the dairy regions in New York, and reports the results of a study by the survey method of the age and tenure of the farmers, wages paid to hired men, average capital per farm, farm receipts and expenses, and labor incomes. Costs of operation were studied under the following headings: concentrates, succulent feed, dry forage, pasture, bedding, labor, hauling milk, use of buildings, use of equipment, interest, depreciation on cows, bull service, and miscellaneous charges. Returns were studied as to milk and milk products, calves born during the year, manure, and miscellaneous returns.

L. J. Norton — An economic study of the production of canning crops in New York. Cornell Univ. Agr. Exp. Sta. Bul. 412. 1922.

This bulletin reports a study by the survey method of the canning-crop industry of New York. There is a discussion of the nature and extent of canning-crop growing, and a discussion of the soil type of farming and other environmental features in each district in New York in which canning crops are grown. Data concerning cost and returns are given for peas, tomatoes, string beans, and lima beans.

- G. F. Warren — Prices of farm products in New York. Cornell Univ. Agr. Exp. Sta. Bul. 416. 1923.

This bulletin reports the results of an extensive study of prices. The following subjects are treated: wholesale prices in the United States for 132 years; monthly prices following the Civil War and the World War; probable prices during the next few years; probable prices during the next fifteen years; factors affecting prices; freight rates and prices; relation of farm prices to wholesale prices; New York farm prices; purchasing power.

- G. F. Warren, Van B. Hart, W. I. Myers, R. L. Gillett, C. V. Noble, and others — Cost accounts for six years on some successful New York farms. Cornell Univ. Agr. Exp. Sta. Bul. 414. 1923.

From data supplied through the cooperation of 110 farmers, an exhaustive cost analysis is made for their farms. A summary table giving the most important data for the years 1914 to 1920 is included.

The following papers are ready for publication:

- R. L. Gillett — A study of farm labor in Seneca County, New York.
 V. B. Hart — Farm motor trucks in New York.
 E. G. Misner — An economic study of dairying on 163 farms in Herkimer County, New York.
 Economic studies of dairy farming in New York. II. Grade A milk with and without cash crops.
 C. V. Noble — The cost of living in a small factory town.
 G. P. Scoville — Production and prices of some important New York crops.
 E. C. Young — A study of the movement of farm population.

Agronomy

In the Department of Agronomy the following papers have been published:

- F. A. Carlson — Some relations of organic matter in soils. Cornell Univ. Agr. Exp. Sta. Memoir 61. 1922.

This investigation comprises a study of the effects of certain soil treatments and cropping systems on the organic carbon and nitrogen in Dunkirk silty clay loam. Liming was the soil treatment tested the most thoroughly, although the effect of potassium sulfate also was tried on other plats. All plats received applications of farm manure. The cropping systems consisted of a rotation without legumes, a rotation with legumes, and grass permanently. Analyses of the soil were made before the experiment was started and ten years later. In general, the limed plats in both series contained more organic carbon and nitrogen than did the unlimed plats. There was a decrease in organic carbon and in nitrogen at the end of the period of experimentation on the plats in rotation without legumes. The plats kept in grass showed an increase in organic carbon and in nitrogen. The plats in rotation with legumes contained more nitrogen than did the plats in rotation without legumes. The increase was greater in the limed plats than in the unlimed plats. This fact seems to indicate that the legumes had some influence on the nitrogen content of the soil studied. The limed plats produced higher yields of crops than did the unlimed plats. The results suggest that there is some relation between the soil content of organic carbon and nitrogen, and yields of crops. The crops in rotation with legumes removed more nitrogen from the soil than did the crops in rotation without legumes. The plats kept in grass lost less nitrogen in the crops than did the plats in rotation with legumes. The ratio of organic carbon to nitrogen remained fairly constant for the various treatments. Thus, if the nitrogen content of the soil increased or decreased under any treatment, the carbon content changed correspondingly.

- J. K. Wilson — The nature and reaction of water from hydathodes. Cornell Univ. Agr. Exp. Sta. Bul. 65. 1923.

In the course of an investigation into the manner in which growing plants influence the nitrate content of soils, Lyon and Wilson found that the roots of growing plants liberate, among other substances, organic matter and also reducing enzymes. A further study by J. K. Wilson of the exudate water of hydathodes of maize, oats, and timothy, shows this water to contain substances similar to that of the plant sap and possibly similar to the secretions from plant roots. Total solids in the water exuded through the hydathodes from maize plants growing under non-sterile conditions were as high as 1030 parts per million. The total solids in water from timothy plants which were growing in closed containers in the absence of microorganisms were much less, being in one case only 573 and in another only 220 parts per million. In all cases the total solids were more than half organic matter. Reactions were obtained which indicated the presence of nitrites, nitrates, materials capable of reducing methylene blue, catalases, and peroxidases, in the exuded water from maize, oats, and timothy. Reductases were probably present in the water from timothy, but no reaction was observed to indicate their presence in the water from maize. The exuded water from various plants was a good medium for the growth of bacteria. This was evidenced by an increase in the number of bacteria in inoculated water. The hydrogen ion concentration of water from hydathodes of maize, oats, and timothy is nearly neutral when the water is exuded by young plants. The acidity increases as the plants become older, until a maximum is obtained.

- J. A. Bizzell — Disappearance of nitrates from soil under timothy. Amer. Soc. Agron. Journ. 14:320-326. 1922.

An experiment is here described in which the fluctuations in the nitrate content of a series of plats in grass treated with different quantities of nitrate of soda were ascertained by periodical analyses. Treatments as large as 900 pounds per acre were given. Even these large quantities of nitrate disappeared rapidly from the soil, while the nitrogen contained in the grass did not account for the disappearance. Evidence obtained from lysimeters indicated that the loss was not due to leaching nor to removal from the soil by denitrification. It appears likely that the nitrate unaccounted for was utilized by various organisms of the soil, and that the nitrate was therefore transformed to ammonia or some organic combination.

- T. L. Lyon, A. J. Heinicke, and B. D. Wilson — The relation of soil moisture and nitrates to the effects of sod on apple trees. Cornell Univ. Agr. Exp. Sta. Memoir 63. 1923.

It has frequently been noted that the continuous growth of grass under apple trees exerts an injurious effect on the growth of the trees. Possible causes of this injury have been suggested by several experimenters. This experiment was undertaken mainly for the purpose of testing the hypothesis advanced by Lyon and Bizzell in 1913, to the effect that the property which they found grass to possess, of causing an almost complete disappearance of nitrates in the soil, might account for the injury to the trees. Apple trees were grown on field plats continuously in sod, and on plats on which rye was used as a cover crop. All plats were fertilized with acid phosphate and muriate of potash. Nitrate of soda was applied to certain of the sod and cover-crop plats at the respective rates of 900, 300, and 100 pounds per acre, and was withheld entirely from others. Moisture and nitrates in the soil were determined from time to time. Measurements were made of the tree growth at the end of each season. At the end of the experiment, the trees were cut off at the surface of the soil and weighed, and the roots were dug and weighed. Moderate differences in moisture content of the soil were observable between the variously treated plats, but they were slight as compared with the differences in the nitrate nitrogen present. Nitrates were always low under the sod except when large quantities of nitrate of soda had been applied recently. Tree growth was greatest on those sod plats which received the greatest quantity of nitrate of soda, indicating a deficiency of available nitrogen under the unfertilized sod. That the removal of moisture from the soil by the grass was not an important factor in tree growth was indicated by the fact

that the growth of the trees was greatest on those sod plats in which the moisture was least, owing to a greater growth of grass resulting from the large applications of nitrate of soda. Apparently the maintenance of an adequate supply of nitrate nitrogen in the soil used in this experiment was the determining factor in tree growth, and soil moisture was very much less important. The injurious effect of the sod on the growth of young apple trees was reduced by the annual application of $\frac{1}{2}$ pound of nitrate of soda per tree. Trees on cultivated plats did not respond to the addition of nitrate fertilizer, whereas those on sod plats receiving $\frac{1}{2}$ pound per tree averaged more than twice the weight of those on sod plats without nitrate. Trees on sod plats receiving nitrate of soda showed vigorous terminal growth, but relatively few strong branches as compared with trees on cultivated plats. Trees on sod plats receiving no nitrate nitrogen had relatively heavy roots as compared with those on cultivated plats, but the roots from trees on sod plats receiving heavy applications of nitrate constituted a much smaller part of the total weight of the tree. The roots from trees on cultivated plats were more fibrous as compared with those from trees on sod plats.

The following papers are ready for publication:

- H. D. Brown — Sulfonation and nitrogen content of a soil.
- T. L. Lyon, J. A. Bizzell, and B. D. Wilson — The immediate and residual influence of certain plants on formation of nitrates in soil.
- J. S. McHargue — The rôle of manganese in soils and plants.
- C. O. Swanson — Soil reaction in relation to calcium absorption.
- N. E. Winters — Effect of lime on the biological processes in soils.

Animal Husbandry

In the Department of Animal Husbandry the following papers have been published:

- C. L. Allen — The effect of the age of sire and dam on the quality of offspring in dairy cows. *Journ. hered.* 13:167-176. 1922.

This paper reports the results of a statistical study of Holstein-Friesian pedigrees. The age of the parentage of high and of low producers was found to be practically the same. A large proportion of the high producers were the first calves of immature dams. The average age of highest production was about six years.

- L. A. Maynard, F. M. Fronda, and T. C. Chen — The protein efficiency of combinations of cornmeal and certain other feeding stuffs, notably rice bran. *Jour. biol. chem.* 55:145-155. 1923.

This paper describes experiments with white rats as to the growth-promoting value of the protein of cornmeal, linseed oil meal, cottonseed oil meal, peanut oil meal, soybean oil meal, and rice bran. The various feeds were studied singly and in combination with cornmeal. The proteins of cornmeal and rice bran were found to supplement each other and furnish a mixture of high quality. The combination of soybean oil meal and cornmeal was found more efficient than cornmeal alone.

- L. A. Maynard, S. A. Goldberg, K. V. Williams, and O. B. Christy — Further studies on "posterior paralysis" in swine. *Soc. Exp. Biol. and Med. Proc.* 20:528-530. 1923.

This paper describes the experimental production of "posterior paralysis" or "leg weakness," in swine, and studies made to ascertain the dietary relationships involved, through attempted cures by the addition of minerals and sources of specific vitamins. Detailed pathological findings, particularly histological studies of the bones, are reported. The lack of minerals was found to be definitely connected with the development of the trouble in some cases but not in others. The histological studies suggested the possibility of scurvy as well as improper mineral assimilation. It is tentatively suggested that the external symptoms characterizing "posterior paralysis" are not necessarily due to a single deficiency in the diet, but that at times the symptoms may be connected with rickets and at other times with scurvy, and that both troubles may occur simultaneously.

The following papers are ready for publication:

- M. W. Harper — Grain for work horses.
M. W. Harper and G. Haines — Maximum hay and minimum grain for the work horse.
M. W. Harper and M. S. Morton — Silage for raising colts.
L. A. Maynard and L. C. Norris — A system of rearing dairy calves with a limited use of milk.

Botany

In the Department of Botany the following papers have been published:

- K. C. Hyde — A gall disease of *Populus*. Anatomy of a gall on *Populus trichocarpa*. Bot. gaz. 74:186-196. 1922.

This is a study in morbid anatomy. The transformations and alterations of the various elements of a normal stem are studied in detail, and the facts recorded.

- W. C. Muenschner — Protein synthesis in *Chlorella*. Bot. gaz. 75:249-267. 1923.

One of the unicellular green algae, *Chlorella* sp., was grown in pure culture in a nutrient solution plus glucose to which combined nitrogen was supplied in inorganic combination either as calcium nitrate or ammonium sulfate. Cultures were grown in diffuse light and in the total absence of light for 105 or 235 days. Quantitative determinations were made of the volume, dry weight, and total nitrogen content, of the growth obtained. The data offer strong evidence indicating that *Chlorella* sp. can synthesize in total darkness when nitrogen is supplied in inorganic combination.

- D. Reddick — Ito's potato variety Ekishirazu in New York. Phytopathology 13:55-56. 1923.

The variety Ekishirazu was subjected to extremely favorable conditions for infection by *Phytophthora infestans* and was found very highly resistant. As the variety seems to be lacking in quality and has not made good growth in the field, hybrids with our common varieties have been obtained for further work.

- Mildred E. Stratton — The morphology of the double kernel in *Zea mays* var. *polysperma*. Cornell Univ. Agr. Exp. Sta. Memoir 69. 1923.

In this variety of maize both flowers of the spikelet, rather than one, develop and function in a certain proportion of cases. The two resulting kernels may be quite distinct, or they may be fused in various degrees, giving in extreme cases a single kernel with two germs (two-seeded fruit, or "connate seed"). The two plants developing from such a double kernel will therefore be no more alike in their assortment of maternal characters than any other two plants grown from kernels of the same ear.

- T. W. Turner — Studies of the mechanism of the physiological effects of certain mineral salts in altering the ratio of top growth to root growth in seed plants. Amer. journ. bot. 9:415-445. 1922.

A series of experiments was conducted to determine the influence of the concentration of nitrates in a nutrient solution on the growth of roots and tops. Using three series of solutions containing low, medium, and high concentration of nitrate, respectively, it was found that the top growth of barley and corn was nearly always increased as the supply of nitrogen was increased. In some cases the medium nitrate showed better top growth than did the high nitrate. The absolute root growth, on the other hand, was usually decreased with the high nitrate. With the medium concentration of nitrate the total root growth was sometimes greater and sometimes less than with the low concentration. The ratio of top to root, however, always increased as the nitrate concentration increased. High nitrate concentration, therefore, always resulted in relatively smaller root growth of corn and barley, and often resulted in actually smaller roots. Flax, however, showed no consistent response to changes in nitrate concentration. This effect on the roots of corn and barley seemed to be independent of total concentration of nutrient solution, for low nitrate resulted in relatively large roots whether the total salt concentration was high or low. It was also found that as the plants grew older the tops always became relatively

larger, so that the older the plant, the smaller were the roots relative to the tops. Though an increase in nitrate concentration of the nutrient solution always decreased the relative growth of roots in barley and corn and often decreased the absolute growth also, evidence was obtained indicating that nitrates do not directly decrease root growth, for isolated root tips in solution with high nitrate grew as well as or better than in those with low nitrate. The explanation offered for the decreased root growth in entire plants supplied with high nitrate is that under these conditions the tops use more of the foods made in the leaves, and therefore less becomes available for root growth.

K. M. Wiegand—*Carex laxiflora* and its relatives. *Rhodora* 24:189-201. 1922.

This is a taxonomic revision of a group of sedges which has long given trouble to botanists. Ten species and two varieties are treated, of which the following are new: *Carex ormostachya* (Canada, New England, New York); *C. cribriflorus* (southeastern United States); *C. styloflexa* var. *fusiformis* (Florida); and *C. styloflexa* var. *remotiflora* (Florida, Alabama). The paper is comprised of keys, descriptions, localities, nomenclature, and discussions of critical points.

The following papers are ready for publication:

- H. Castle—The anatomy of the flowers of the genus *Saururus*.
- O. F. Curtis—The method of movement of water, nutrients, and foods in plants. the factors affecting this movement, and the tissues concerned in it.
- M. J. Fisher—Anatomy of flowers of the Salicaceae.
- A. L. Grant—Revision of the genus *Mimulus* (Scrophulariaceae).
- R. S. Nanz—Hydrogen ion concentration and other factors influencing germination and growth of orchid seeds.
- L. F. Randolph—The morphology of the pericarp in maize, with relation to the behavior of certain inherited characters.
- D. Reddick and V. B. Stewart—Crown gall of apple and peach, with notes on the biology of *Bacterium tumefaciens*.

Dairy Industry

In the Department of Dairy Industry the following paper has been published:

Walter W. Fisk and Walter V. Price—The clarification of milk for cheese making. *Cornell Univ. Agr. Exp. Sta. Bul.* 418. 1923.

The studies reported in this bulletin indicated that clarification changes only slightly, if at all, the composition of milk. The fat loss in the whey is slightly less with clarified milk than with the same milk not clarified. Clarification of the milk affects the yield of cheese by the losses during the process of manufacture, and the moisture incorporated into the cheese. The average scores show that clarification of the milk improves the quality of the cheese, and cheese made from clarified milk keeps better in storage than does cheese made from the same milk not clarified. The quality of the cheese is improved by clarification of the milk, regardless of the quality of the milk from which the cheese is made. The clarifier shows its effect on the cheese, whether or not commercial starter is used.

The following papers are ready for publication:

- H. C. Jackson—Some studies on the neutralization of cream for butter-making.
- H. A. Reuhe—A study of the effect of the process of manufacture upon the germ content of bulk condensed milk.
- C. L. Walker and others—Studies on the treatment and the disposal of dairy wastes. (This work was performed with the cooperation of the Departments of Agricultural Chemistry and Entomology.)
- W. A. Whiting—A study of the possible relationship existing between the grouping of bacteria in market milk and the utensil flora.

Entomology

In the Department of Entomology the following papers have been published:

John D. Detwiler — Three little-known clover insects: the clover-head weevil (*Phytonomus meles* Fab.), the lesser clover-leaf weevil (*Phytonomus nigrirostris* Fab.), the clover-seed weevil (*Tychius picirostris* Fab.). Cornell Univ. Agr. Exp. Sta. Bul. 420. 1923.

This bulletin reports the results of a study of the life history, distribution, and means of control of these insects, and of the injuries caused by them.

W. T. M. Forbes — Lepidoptera of New York and neighboring States. Cornell Univ. Agr. Exp. Sta. Memoir 68. 1923.

The wing-venation of the Coleoptera. Ent. Soc. America. Ann. 15:328-345. 1922.

In this paper the author establishes the homologies of the wing veins of the Coleoptera according to the Comstock-Redtenbacher system, as shown by the evidence of the tracheation, basal sclerites, and comparison with the Neuroptera, and between the various families of the order.

Glenn W. Herrick — The maple-case bearer, *Paraclemensia acerifoliella* Fitch. Journ. econ. ent. 15:282-288. 1922.

The biology, distribution, and injuries of this insect are discussed in this article.

The maple case-bearer. Cornell Univ. Agr. Exp. Sta. Bul. 417. 1923.

This bulletin presents a full discussion of the economic importance of the maple case-bearer, together with an account of it in America, its life history, and methods of control.

Glenn W. Herrick and Wallace Colman — The cabbage maggot, with special reference to its control. Cornell Univ. Agr. Exp. Sta. Bul. 413. 1922.

This bulletin comprises a brief summary of the life history of the cabbage maggot, and a detailed account of experiments with corrosive sublimate as a control of the pest on radishes and maggots.

Glenn W. Herrick and C. H. Hadley, jr. — The clover-leaf weevil. Cornell Univ. Agr. Exp. Sta. Bul. 411. 1922.

A detailed discussion of the injuries, distribution, and life history of this weevil is given in this bulletin, with suggestions regarding its control.

O. A. Johannsen — Stratiomyiidae larvae and puparia of the Northeastern States. New York Ent. Soc. Journ. 30:141-154. 1922.

This paper reports the results of a study of a class of insects used largely as food for fishes.

The pigment cells in the eyes of *Drosophila* eye-color mutants. Anaton. rec. 24:411. 1923.

This study of the structure of the eye in a number of the eye-color mutants of *Drosophila melanogaster* shows that the difference in color in the various mutants is due to the amount and distribution of but two colors, ocher and magenta.

North American Dixidae. Psyche 30:52-59. 1923.

This paper contains keys and descriptions of the Dixia midges occurring in North America.

R. Matheson — The wax-secreting glands of *Pseudococcus citri* Risso. Ent. Soc. America. Ann. 16:50-56. 1923.

This is a study of the structure and function of the wax-secreting glands of an important coccid species common on greenhouse plants in the North.

R. Matheson and R. C. Shannon — The anophelines of northeastern America. Insec. Inscit. Mens. 11:57-64. 1923.

This paper gives a short account of the anophelines of the region indicated, with new keys to larvae and adults. The authors describe for the first time the adult male and the larva of *Anopheles walkeri* Theo., and also its breeding habitat.

J. G. Needham and P. W. Claassen — The North American species of the genus *Acroneuria* (Order Plecoptera). Canad. ent. 54:249-255. 1922.

This is a revision of the genus *Acroneuria*, with descriptions of a new sub-genus and two new species and a table for identification of the species within the genus.

The following papers are ready for publication :

P. W. Claassen — New species of North American stoneflies (Plecoptera).
The larva of a chironomid (*Trissodadius equitans* n. sp.) which is parasitic upon a mayfly nymph (*Rethrogena* sp.).
G. C. Embury — The effects of temperature on the rate of development of trout eggs.
The habits and propagation of trout.
U. E. Emerson — The termites of Kartobo, British Guiana.
W. T. M. Forbes — Trap-lantern record at Ithaca, New York (Lepidoptera).
S. W. Frost — The leaf-mining Diptera of North America.
H. G. Good — The wing venation in the Buprestidae.
G. W. Herrick — The activities and injuries of the cloaked knotty-horn (*Desmocerus palliatus*).
H. C. Hockett — The Anthomyiinae of New York State.
R. Matheson — An account of the mosquitoes (Culicidae) of the Douglas Lake region, Michigan.
V. T. Phillips — The fruit flies of the Northeastern States.
N. H. Stewart — Food, growth, and assessment of age of the common sucker, *Catostomus commersoni*.
L. P. Wehrle — The clover-seed caterpillar.

Forestry

In the Department of Forestry the following papers have been published :

P. A. Herbert — Standing timber insurance. (Mimeographed.)
R. S. Hosmer — Impressions of European forestry. Lumber world review. 1922.
A. B. Recknagel — Growth of spruce and balsam fir in the Adirondacks. Journ. forestry 20:598-602. 1922.

This study was made in order to ascertain the rate of growth of red spruce and balsam fir in the Adirondacks on an area cut over thirty years ago, near Newcomb, New York. The area had been logged for spruce to an approximate diameter of 10 inches. A detailed description of the plan for making the measurements is presented. The results are published in the form of tables showing for both the red spruce and the balsam fir, in the spruce-flat type and also in the hardwood type, the current annual increment percentages. The following conclusions may be drawn from the figures: (1) Balsam fir has a uniformly higher growth rate than spruce. (2) The growth of both species, except for the larger spruces, is better on the hardwood type than on spruce flats. (3) The growth rate averaged over the entire thirty-years period is in excess of that during the period required to grow the last inch in radius. (4) The average current growth is as follows:

Forest type	Spruce flat		Hardwoods	
	Red spruce	Balsam fir	Red spruce	Balsam fir
Species.....				
Stand per acre (cords).....	19.477	7.873	6.17	4.88
Annual growth (cords).....	0.616	0.253	0.17003	0.1818
Annual growth (per cent)....	3.11	3.21	2.76	3.73

Growth of spruce and balsam fir in Nova Scotia. Canadian forestry mag. 19:40-41. 1923.

The figures of growth of spruce and balsam fir are, so far as it is known, the first that have been published for these species in Nova Scotia. The three tabular statements show respectively, for white spruce, balsam fir, and re

spruce, the diameters of the trees in inches, the volumes of the individual trees in cords, the years required to grow the last inch in diameter, and the corresponding current annual increment percentages. For white spruce the data are given for trees from 5 to 17 inches in diameter, inclusive, and the current annual increment percentage ranges from 4 per cent for the 5- and 6-inch trees to 1.75 per cent for the 17-inch trees. For balsam fir the data are given for trees having diameters from 5 to 13 inches inclusive, and the current annual increment percentages range from 4.4 per cent for the 5-inch trees to 1 per cent for the 13-inch trees. For red spruce the data are given for trees of from 5 to 13 inches in diameter, inclusive, and the current annual increment percentages range from 2.48 per cent for the 7-inch trees to 0.5 per cent for the 13-inch trees (figures for 5- and 6-inch trees are not included).

The forests of New York State. Published by the Macmillan Company, 1923.

A. B. Recknagel and G. Q. Lumsden — Sample working plans for the Adirondacks. Empire State Forest Products Assn. Bul. 15. 1922.

Meteorology

In the Department of Meteorology the following paper is ready for publication:

R. A. Mordoff — The climate of New York State.

Plant Breeding

In the Department of Plant Breeding the following papers have been published:

H. H. Love — The importance of the probable error concept in the interpretation of experimental results. Amer. Soc. Agron. Journ. 15:217-224. 1923.

The importance of applying the probable error concept to agricultural experiments is discussed. Different formulae are presented and the importance of Student's method is shown. The relation between Bessel's and Peter's formulae is explained, and also the relation between the probable error of the mean as obtained by Bessel's formula and that obtained from the usual formula, $\pm 0.6745 \frac{S. D.}{\sqrt{n}}$.

The application of probable error to agricultural experimentation. Washington Proceedings of the Association of Land-Grant Colleges. 1923.

The importance of interpreting results with the probable error concept in mind is discussed and errors due to careless calculation are shown. These errors are not considered in the probable error concept. Various examples are used to illustrate how necessary the calculation of the probable error is in many experiments. It shows the reliability that may be placed in results, and illustrates the need for caution in generalizing from too few observations.

C. H. Myers and F. R. Perry — Analysis and interpretation of data obtained in comparative tests of potatoes. Amer. Soc. Agron. Journ. 15:239-253. 1923.

This is a study of a number of factors concerned in making comparative tests of potatoes. Original data are presented which show the effect of competition on the relative yields of apical and basal hills. Competition is an important factor, but varies with varieties. The relation of size of plot and number of replications, to the probable error, is discussed. The results indicate that the 25-hill plot, replicated ten times, gives a fairly reliable measure of comparative yields.

The following papers are ready for publication:

E. G. Anderson — A case of maternal inheritance of chlorophyll in maize.

E. G. Anderson and R. A. Emerson — Pericarp studies in maize. I. The inheritance of pericarp colors.

A. M. Brunson — The inheritance of a lethal pale green seedling character in maize.

M. Demerec — The inheritance of white seedling in maize.

Heritable characters in maize: germless seed.

- E. Dorsey — Cytological studies of the reduction division in cereal hybrids. I. Chromosome behavior in certain interspecific wheat hybrids. II. Chromosome behavior in certain *Avena* hybrids.
- R. A. Emerson — The inheritance of blotch leaf in maize.
- C. H. Myers — Potato breeding in America.
- C. F. Noll — A study of inheritance of earliness in certain *Avena* crosses.

Plant Pathology

In the Department of Plant Pathology the following papers have been published:

- F. M. Blodgett — Hot water and hot air treatment of potatoes. (Abst.) *Phytopath.* 13:55. 1923.
A summary is given of the conditions of time and temperature under which potatoes are killed in a hot-water bath and in a hot-air oven. Neither treatment was successful in the control of leaf roll or mosaic.
- C. Chupp and G. L. Clapp — *Fusicoccum* canker on apple. *Phytopath.* 13: 225-230. 1923.
A new disease of the apple, affecting nursery stock in storage and trees in the orchard, is here described. A new species of *Fusicoccum*, *F. pyrorum*, is shown to be the cause.
- F. Dickson and W. R. Fisher — A method of photographing spore discharge from apothecia. *Phytopath.* 13:30-32. 1923.
This article shows how the cloud-like puffs of spores from apothecia of *Sclerotinia libertiana* Fekl. were satisfactorily recorded on a photographic film.
- K. H. Fernow — Spindling tuber or marginal leaf-roll. (Abst.) *Phytopath.* 13:40. 1923.
An account is given of the symptoms of the disease on vines and tubers, and circumstantial evidence of its transmission.
A new host for potato mosaic. (Abst.) *Phytopath.* 13:40-41. 1923.
Evidence is presented to show that potato mosaic may be readily transmitted to *Nicandra physalodes*, the apple of Peru, while tobacco mosaic is not transmitted under the same conditions.
- H. M. Fitzpatrick — Monograph of the Nitschkieae. *Mycologia* 15:23-67. 1923.
A taxonomic study of a group of genera which have been previously misplaced and misunderstood. The investigation is based on a study of material in all of the large herbaria of the eastern United States, and on specimens obtained from American and foreign correspondents. The paper constitutes a contribution toward a better knowledge of the large group *Pyrenomycetes*, which includes numerous fungi of scientific and economic importance.
A survey of the evidence indicating that *Phytophthora* should be merged with *Pythium*. (Abst.) *Phytopath.* 13:34. 1923.
Attention is called to the lack of a basis for separation of the two economically important genera *Pythium* and *Phytophthora*, and the suggestion is made that they be merged.
- R. S. Kirby — Heterothallism in *Ophiobolus cariceti*. (Abst.) *Phytopath.* 13:35. 1923.
The existence of plus and minus strains of the fungus causing take-all of wheat is shown. Perithecia are produced only when both strains are present.
- L. M. Massey and H. W. Fitch — Some results of dusting experiments for apple scab and peach leaf curl in 1921 and 1922. *New York State Hort. Soc. Proc.* 68:42-60. 1923.
Under conditions favorable for scab development, sulfur dusts gave as good control of scab as did liquid lime-sulfur. An equal number of treatments of dusts and sprays were made. The dusts compared favorably with sprays in the control of insect pests also. The costs of treatments under experimental conditions were in favor of spraying. The results of a preliminary experiment indicate that peach-leaf curl may be controlled by the use of dusts.
- A. G. Newhall — Seed transmission of lettuce mosaic. *Phytopath.* 13:104-106. 1923.
Mosaic of lettuce was found to carry over in seed from diseased plants.
The importance of the *Phoma* stage of *Mycosphaerella rubina* causing spur blight of raspberries. (Abst.) *Phytopath.* 13:44-45. 1923.

The Phoma, or imperfect, stage of *Mycosphaerella rubina* (Pk.) Jacq. is shown to be a normal part of the life cycle of this pathogene. Culture studies and inoculation experiments demonstrated the connection between the perithecial and pycnidial stages.

F. R. Perry — Methods in the improvement of seed potatoes. Potato Assn. America. Proc. 9:64-68. 1922.

This paper records satisfactory results of incorporating into a seed-improvement program a combination of such phases as roguing, tuber-unit and hill-unit methods of obtaining pure lines, tuber indexing, isolation of the seed plat, and careful protection by spraying.

H. H. Whetzel — The *Alternaria* blight of potatoes in Bermuda. Phytopath. 13:100-103. 1923.

This is a brief note on the epiphytotic development of *Alternaria solani* in Bermuda in the fall potato crop of 1921.

Report of the Pathologist for the period June 10th to December 31st, 1921. Bermuda Reports of the Board and Department of Agriculture, 1921:30-64. 1922.

This is a report on observations and investigations made on the diseases and insect pests of plants in Bermuda in 1921-22. Those of special interest were: a bamboo shoot-rot caused by a species of *Rhizoctonia*; a mite disease of *Cosmos sulphureus*; a stunt disease of lettuce caused by a species of *Pythium*; diseases of the Bermuda lily, especially a stump rot caused by *Phytophthora* sp., and the black scale, the cause of which was not definitely determined; an epiphytotic of the West Indian peach scale on the oleander and other plants; observations on the pink root of onions caused by *Fusarium mali*; a white scale of the native palmetto, which has recently appeared in the islands; a blight of *Catharanthus roseus* caused by *Phytophthora parasitica*; an epiphytotic of early blight of potatoes; and failure of germination in potatoes possibly caused by the red mite, *Rhizoglyphus hyacinthi*.

The following papers are ready for publication:

F. M. Blodgett — Heat treatments of potatoes.

O. C. Boyd — Investigations on the relative efficiency of some copper fungicides in the control of potato diseases and insect pests.

W. H. Burkholder — The Gamma strain of *Colletotrichum lindemuthianum* (Sacc. et Magn.) B. et C.

The effect of varying soil moistures on healthy bean plants and on those infested by a root parasite.

H. W. Dye and A. G. Newhall — The control of bacterial blight of celery by spraying and dusting.

H. M. Fitzpatrick — Generic concepts in the Pythiaceae and the Blastocladiaceae.

L. O. Gratz — Wire-stem of cabbage.

R. S. Kirby — The take-all disease of cereals and grasses caused by *Ophiobolus cariceti* (B. and Br.) Sacc.

Pomology

In the Department of Pomology the following papers have been published:

W. H. Chandler — Results of some experiments in pruning fruit trees. Cornell Univ. Agr. Exp. Sta. Bul. 415. 1923.

This bulletin reports the results of a study of the effect on the growth and fruitfulness of the trees, of pruning apples, pears, peaches, plums, and cherries; a study of the effect of pruning at different seasons; and a study of special problems involved in training trees. Advice is also given as to the best methods of pruning the trees of each kind of fruit grown in New York.

Arthur John Heinicke — Factors influencing catalase activity in apple-leaf tissue. Cornell Univ. Agr. Exp. Sta. Memoir 62. 1922.

A method of preparing apple-leaf tissue for catalase tests is described in this memoir, and the details of the determinations are given, with evidence regarding their dependability. The influences of agitation, ineffective neutralization, concentration of solution, strength of hydrogen peroxide, and interval between

preparation and determination, are indicated. The catalase activity shown by leaves from twigs that have been standing in water is greater than that shown by the same leaves before the twigs are removed from the tree. Wilting of the tissue reduces the power to decompose hydrogen peroxide. A relatively high catalase activity is shown by preparations of leaves from trees growing in good soil, from those receiving clean cultivation, or from heavily pruned or nitrogen-fertilized trees in sod. On the other hand, the activity is relatively low in preparations of leaves from trees growing in poor, sandy, or non-cultivated land receiving no fertilizer, and from trees that have been ringed or otherwise injured in such a way as to reduce vegetative activity. The results suggest that the catalase test may serve as a rather sensitive indicator of the nutritive condition, and as an early measure of responses of the apple to cultural conditions or treatments which otherwise could not be measured for many months.

Catalase activity as an indicator of nutritive condition of fruit tree tissues. *Amer. Soc. Hort. Sci. Proc.* 19:209-214. 1922.

This paper is based on data found in Cornell Memoir 62. A relatively low catalase activity seems to accompany the nutritive condition in which the proportion of nitrogen to carbohydrates is very low. The higher the proportion to carbohydrates, apparently the greater is the catalase activity. It is pointed out that the catalase tests promise to be especially well adapted for studies involving frequent determinations of the same material, because many samples can be taken to establish the limits of normal variation without necessitating the destruction or serious injury of the experimental subject. The changes going on from day to day, or even from hour to hour, may be detected by the catalase activity of leaf tissue.

- L. H. MacDaniels—The apple-tree crotch: histological studies and practical considerations. *Cornell Univ. Agr. Exp. Sta. Bul.* 419. 1923.

A study of the apple-tree crotch from the standpoint of both its histological structure and its mechanical features. Histologically, crotch tissue differs from normal woody tissue in having more parenchyma, larger medullary rays, and fewer vessels and wood fibers. All tissues are distorted in their arrangement as compared with normal tissue—a distortion which is found in the cambium itself. In every crotch there is a more or less definite line of cleavage, where the tissues of the two branches of the crotch lie adjacent and across which there is very little interlacing of fibers or other elements. The lines of conduction for the two branches of a crotch are separate and distinct. Mechanically, crotches with the two branches of equal size, and those with narrow angles, are weak. More than two branches coming off the trunk at nearly the same point give a weak scaffold. These defects can be prevented by proper pruning of the young tree. With older trees, bracing is a practical expedient.

Fruit bud formation in *Rubus* and *Ribes*. *Amer. Soc. Hort. Sci. Proc.* 19:194-200. 1922.

Observations on fruit-bud formation in *Rubus* and *Ribes* were made in 1914, 1915, 1916, and 1917. Two lines of investigation were carried on: one, the collection of buds at different stages and their examination with the microscope; the other, the pruning of the canes to different lengths, observing the nature of the buds and the effect on fruiting. The buds of the gooseberry and the currant were found to differentiate into flowers for the next season about the middle of August. Blackberry buds showed the differentiation of flower primordia early in September. Black and red raspberries were not clearly differentiated until early spring. The pruning experiment showed that with the bramble fruits all buds are potentially fruit buds. A large proportion of the buds, with the possible exception of those at the base of the cane, differentiate into flowers in the season previous to fruiting or very early in the spring. Buds with growing points not differentiated may either form terminal flower clusters and bear fruit a week or more after the normal season, or, as is frequently the case with the blackberry, form vegetative shoots only. The fact that some varieties of raspberries fruit in the fall at the end of the current season's canes, also indicates that the vegetative shoots are not determinate, but may or may not form fruit buds according to conditions.

- T. L. Lyon, A. J. Heinicke, and B. D. Wilson — The relation of soil moisture and nitrates to the effects of sod on apple trees. Cornell Univ. Agr. Exp. Sta. Memoir 63. 1923.

(Abstract given under Agronomy.)

The following papers are ready for publication:

- D. B. Carrick — Freezing injury in the fruit of the apple.
A. J. Heinicke — Catalase activity in dormant apple twigs; its relation to the condition of the tissue, respiration, and other factors.

Rural Education

In the Department of Rural Education the following papers have been published:

- J. E. Butterworth — A score card for one- and two-teacher school buildings. Journ. rural ed. 2:9-20.

This paper describes the method used in developing the score card for buildings.

Summary of school building survey of Roslyn, New York, p. I-II. (In cooperation with F. H. Wood, Albany, New York.) Board of Education, Roslyn, New York.

This summary analyzes existing school-building facilities; shows growth of school population during the last fifteen years and estimates the probable building needs up to 1930; states certain principles governing the location of school buildings and applies those principles to conditions at Roslyn; and gives data regarding the cost of meeting building needs and the relative ability of the community to provide the necessary facilities.

- E. N. Ferriss — The rural high school. Rural school survey of New York State, volume 7.

This is a statistical and interpretative study of the rural high schools of New York. The main problems considered are: the distribution of rural high schools and their pupil population; the organization of the rural high school; its administration and supervision; the teaching staff; classroom instruction; the curriculum; recommendations for improvement.

Curriculum building in the rural high school. School review 31:253-266. 1923.

This paper gives some suggested principles for the organization and content of the curriculums of the rural high school, based upon the functions of the rural high school, its problems due to a limited teaching staff, its equipment, its small pupil population, and the needs and demands of the pupils, the community, and society.

- G. A. Works — The community unit. Rural school survey of New York State, volume 2 on administration and supervision, p. 543-577.

Data were obtained on approximately two thousand farm girls and boys who were in attendance at high schools during the academic year 1920-21, for the purpose of determining the relationship between attendance and such factors as distance from high school, transportation facilities, and roads. On the basis of these facts, a recommendation was made for the formation of a local unit of rural school administration with reference to the existing communities. In the formation of these units, town and county boundaries would not necessarily be followed.

The following papers are ready for publication:

- T. L. Bayne — A study of the reliability of a uniform system of high-school examinations as a measure of achievement.
T. H. Eaton — The principles of organization of the training of teachers of agriculture.

Rural Social Organization

In the Department of Rural Social Organization the following papers are ready for publication:

E. L. Kirkpatrick — The standard of life in a typical section of diversified farming.
Dwight Sanderson and Warren S. Thompson — The social areas of Otsego County.

Vegetable Gardening

In the Department of Vegetable Gardening the following paper has been published:

E. V. Hardenburg — Some recent aspects of potato variety testing. Potato Assn. America. Proc. 9:37-41. 1923.

The yield variation which may be expected to exist commonly between strains of a single variety is demonstrated by a summary of the results at the Cornell station in 1922, with 57 strains of four standard potato varieties. Evidence on the comparative adaptation of varietal groups and climatic conditions at Ithaca, New York, is presented in the form of a summary of average yields of twelve groups comprising 197 potato varieties tested over a period of seven years.

The following papers are ready for publication:

H. W. Schneck — Pollination studies of greenhouse tomatoes.
Paul Work — Nitrate of soda in the nutrition of the tomato.

THE STATE EXTENSION SERVICE

One of the largest and most immediately useful functions of the College of Agriculture is to improve the status of farming and homemaking, and of the persons engaged therein, by means of extension teaching. There is evidence on every hand that this service is contributing vitally to the stability, the integrity, and the permanence of the State's agriculture and rural home life, and to the ability, the success, and the contentment of the rural population. It cannot overcome the effects of widespread economic disturbance, but it can do much to lessen the severity of the disturbance and to promote readjustments or other measures which look toward the rectification of the troubles. It is yielding results to the Commonwealth and to the Nation of far-reaching importance. It has fully taken its place as one of the essential parts of the public educational system of the State.

On the following pages there are outlined, in brief summaries, the more important types of service performed by the departments and offices of the College, with such statistical data as are required to indicate the response of the people to the work. In view of the fact that the requests for the service originate in the counties and with the rural people, the College refraining from all forms of superimposed activity, a reading of these pages will afford ample evidence that farmers and their families are voluntarily using, in a most gratifying and pressing degree, what the State and Federal Governments are making available through the State College.

As the work matures, it becomes increasingly adapted to the needs or interests of individuals, and general work is giving place to specific and specialized work. This means that the groups demanding a particular form of service are likely to be smaller and better selected according to specialized interests, but that the work is more intensive, each group receives the particular help it desires, and the number of such specialized groups reached steadily increases. This is a most desirable condition.

and makes for greater actual, but less spectacular, progress. The farmer's need is increasingly for specialists, not generalists; and the service is undergoing slow but constant change and adaptation in accordance with the changing needs of the constituents. This keeps the work very fresh and stimulating, and free from stagnation or outworn repetitions.

The following account of the extension service is commended to the attention of persons interested in current agricultural progress and in what the State, in cooperation with the United States Department of Agriculture, is offering to the great body of the rural population of the State who are unable by reason of age, circumstance, or previous schooling, to acquire a formal education in agriculture and homemaking by attendance at the schools and the State College.

Administration

At a time when many public agencies, especially those concerned primarily with agriculture, have felt keenly the pressure of the drastic agricultural depression, it is noteworthy that support by New York farmers of their educational institutions has been maintained. In fact, local contributions in support of the farm and home bureaus, through appropriations by boards of supervisors and membership fees, have even slightly increased over those of the preceding year. This fact cannot be interpreted otherwise than as a most sincere and hearty indorsement by the public of the efficient functioning of the organization which they have set up.

Perhaps the most outstanding accomplishments during the past year have been: (1) the results of the joint effort of three departments in a lime-legume-livestock campaign designed to guide farmers in lowering the cost of producing milk and to establish a permanent system of dairy farm management; (2) the remarkable forward stride made in forestry projects, which found expression in much planting of forest trees and quickened interest in forest conservation, marking the cumulative result of many years of public agitation and exhortation; (3) the growing appreciation on the part of fruit and vegetable growers of the importance of high quality and uniformity of pack in advantageously disposing of their product; (4) continued progress (due largely to efforts of the State Department of Farms and Markets) in control of bovine tuberculosis; (5) the complete transfer of responsibility for poultry certification to a cooperative association, and rapid growth in adoption of utility standards and breeding for production; (6) very substantial progress in the commercial introduction and use of better seeds on a large scale; and (7) most important of all, the steady growth in local leadership in the rural communities in nearly all lines of effort.

Farmers' Week. The sixteenth annual Farmers' Week was held February 12 to 17, 1923. The number of persons registered was 3034, as compared with 3830 last year. The registration represented practically every county in New York, and 19 other States. Severe snowstorms, which completely blocked transportation for nearly two days and interfered with travel throughout the week, greatly reduced the attendance.

The program consisted of 297 lectures, 99 demonstrations and round tables, 51 laboratory courses and practice periods, 46 exhibits by departments, 15 conventions and conferences, 9 speaking and judging contests, and 27 entertainments (including banquets, concerts, and motion picture showings)—making a total of 544 events, as compared with 520 last year. There were 72 cooperating lecturers from outside the college staff.

For the first time, a special program was offered for grange masters and lecturers. This was given from 9 to 11 on Wednesday, Thursday, and Friday, and met with a fine response from grange members. The attendance increased with each meeting, and at the close the group asked that the meetings be repeated and enlarged next year.

Field Days. The Field Days for 1923, held on June 27, 28, and 29, were given over largely to the juniors and to the visit of the farm bureau agents, executive committeemen, and community project leaders, to go over the experimental work at the Geneva and Ithaca stations. There was a total attendance of 86 on this inspection trip.

The junior extension leaders in the various counties were responsible for the attendance at the Junior Field Days. Several of the leaders used the Field Day as a reward of certain achievements in club work. The total attendance of juniors was 558. The juniors were housed in the university dormitories. The program was arranged to give the girls and boys entertainment, recreation, some definite instruction relating to junior project work, and, above all, an inspiration to carry on their school and project work.

State Fair. The annual exhibit at the State Fair furnished by the College consisted chiefly of exhibits as follows: (1) A 12-foot overshot water wheel in operation generating electricity for use on the farm. The object was to demonstrate the utilization of small streams. (2) Correlated with that exhibit, a farm kitchen equipped with running water and labor-saving electrical appliances. (3) A model layout of two rural schools contrasting good and bad types for both buildings and grounds, and showing graphically the results of the survey made by the Committee of Twenty-One. (4) An exhibit of improved strains and types of cereals and potatoes. (5) An exhibit of plant materials for landscaping purposes. (6) A demonstration and exhibit of right and wrong methods of cooling milk on the average dairy farm. (7) A farm home interior designed to call attention to college publications. (8) A model, in graphic form, showing certain large problems in the poultry industry, a poultry marketing exhibit, and a full-size model colony house and breeding house. (9) A forestry exhibit to suggest perpetuation of forests through wise use. (10) A series of exhibits and demonstrations of girls' and boys' club work, explaining the program. (11) An exhibit of products of the Indian reservations, calling attention to the extension work being done by the College with Indians. (12) The Little Country Theater.

All these exhibits attracted much attention, though no complete measure of interest was attempted. At one exhibit 1016 persons asked questions or discussed personal problems with the instructor in charge. At another it was estimated that 7000 persons stopped to see the exhibit and 700 asked questions.

In addition several members of the staff took part in the fair as superintendents of departments or served as judges of various exhibits.

County fairs. Extension service at the county fairs consisted almost

Summary includes state wide and out of state activities not shown on map

exclusively in demonstrational judging, largely of livestock but including also the judging of vegetables, fruits, farm crops, flowers, junior exhibits, and grange exhibits. Some assistance was given to county agents in the preparation of farm bureau exhibits at local fairs.

A growing demand for pageants and amateur dramatic productions, usually referred to as the "Little Country Theater," called for an increasing amount of assistance. This is one of the healthiest developments of the county fairs, and is helping to solve the recreational phase which much commercial amusement has often helped to degrade. In addition to correspondence, bulletins, and informational lectures, 15 days help was furnished to four fair associations, directing pageants as a demonstration.

There were but three exhibits unaccompanied by a specialist sent to fairs this year — two of poultry and one of rural engineering.

Specialists spent a total of 73 days at town and county fairs, reaching 32 fairs in 28 counties. No records were kept of the number of individuals reached through exhibits.

Extension schools. Extension schools of from three to five days duration remain an important feature of winter meetings, providing a rare opportunity for persons in rural communities to obtain intensive detailed instruction. In the order of amount of time devoted to extension school teaching in the 45 schools held last winter, instruction was given in rural engineering, poultry, agricultural economics and farm management, agronomy, pomology, animal husbandry, entomology, vegetable gardening, plant pathology, and dairy industry. A relatively large proportion of these schools were held in communities not formerly reached with this type of instruction. The total enrollment for the 45 schools was 1443, or an average of 32 students for each school, the range being from 15 to 82.

An increasing number of one-day and two-day meetings in which the school method is employed, are being called for. Among such are the local-leader training schools chiefly conducted by home economics instructors.

Lectures and demonstrations. While the past year has shown no decrease in the number of lectures given, there is a growing conviction on the part of extension specialists and county agents that one-day or one-session meetings, with an audience made up of persons with diverse interests, are becoming less and less necessary. The tendency seems distinctly in the direction of fewer meetings, with smaller groups of persons selected both on the basis of common interest in a definite project and on leadership ability.

The attached table indicates the number of lectures, demonstrations, and other types of meetings held, with the respective aggregate total attendance records. Very little difference from the preceding year, either in the total amount of effort expended or in the number of persons reached, is observed. Such change as appears is in the right direction. The totals shown in the table refer only to subject-matter departments. In addition, 1646 days of field work was performed by the administrative officers in charge of the several branches of the Extension Service and the Office of Publication. In the main these field activities involve conferences with county agents and executive committees, and similar meetings, but they include lectures also, mainly on some phase of organization and on general topics. There were 1666 such meetings, with a total attendance of 67,007.

SUMMARY OF FIELD ACTIVITIES FROM JULY 1, 1922, TO JUNE 30, 1923

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Visits	Conferences		Lectures		Miscellaneous (number of days)	Number of teaching contacts
		Num-ber	Attend-ance	Num-ber	Attend-ance	Num-ber	Attend-ance		Num-ber	Attend-ance	Num-ber	Attend-ance		
Agricultural Chemistry.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	125	.....	125
Agricultural Economics.....	320	38	2,246	5	134	5	46	202	27	184	311	11,454	8	14,266
Agronomy.....	386	12	647	25	119	1	9	323	44	463	416	11,576	27	13,137
Animal Husbandry.....	470	118	7,225	31	31	1	16	323	63	577	382	10,022	27	18,194
Dairy Industry.....	199	46	726	2	3	.....	.....	124	123	350	52	2,183	37	3,386
Entomology.....	232	20	338	16	863	5	15	212	54	306	119	12,091	14	13,825
Entomology and Plant Pathology field assistants.....	1,040	132	1,720	59	440	14	100	5,074	158	447	15	340	32	8,121
Floriculture and Ornamental Horticulture.....	103	5	103	.....	.....	.....	.....	254	71	293	59	3,554	21	4,204
Forestry.....	154	53	925	25	202	.....	.....	46	67	797	42	2,244	17	4,214
Plant Breeding.....	221	34	389	2	4	.....	.....	240	10	106	22	847	28	1,586
Plant Pathology.....	265	60	2,230	54	426	.....	.....	608	63	338	56	2,610	74	6,212
Pomology.....	202	110	1,800	17	306	.....	.....	281	15	229	83	3,373	16	5,989
Poultry.....	1,206	394	8,346	.....	.....	4	32	1,436	87	998	479	18,152	86	28,964
Rural Education.....	13	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	2,670	.....	2,670
Rural Engineering.....	486	639	13,288	22	84	.....	.....	98	12	120	20	663	62	14,253
Rural Social Organization.....	149	7	113	1	156	84	1,409	.....	12	144	111	10,028	5	11,850
Vegetable Gardening.....	247	41	1,175	8	550	2	43	259	122	840	209	14,183	18	17,050
Total Agriculture.....	5,695	1,709	41,271	267	3,318	116	1,670	9,480	928	6,192	2,392	106,115	472	168,046
Home Economics.....	1,402	21	1,416	71	671	864	9,857	15	725	7,047	764	31,589	53	50,595
Total.....	7,097	1,730	42,687	338	3,989	980	11,527	9,495	1,653	13,239	3,157	137,704	525	218,641

County agent changes

There have been so many changes in the personnel of county agents that it has seemed desirable to make a study of their training, experience, and salaries, the sources from which they are drawn, and the positions to which they go. This study does not reveal any abnormal reasons for the frequent changes, but, on the other hand, seems to explain the situation fairly clearly.

Training. The technical training of county agents seems to be satisfactory. Of all the agricultural agents, 84 per cent hold college degrees (2 per cent of which are advanced degrees), and every agent has had some college training, although 16 per cent are without degrees. Among home demonstration agents, 72 per cent hold degrees (including 5 per cent with advanced degrees), leaving 28 per cent with college training but without degrees. Of the junior extension agents, 75 per cent hold college degrees, and the other 25 per cent have had college training without degrees. All club agents appointed during the past year are graduates of approved colleges of agriculture with bachelor's or master's degrees. The New York State College of Agriculture has trained about 80 per cent of the agricultural agents and club agents, but a considerably smaller percentage of the home demonstration agents.

Experience. The average age of agricultural agents now employed is thirty-two years; at the time of beginning the work, it was twenty-eight years and nine months. The average number of years of employment of agricultural agents after leaving college and before beginning work as county agent, is five years and three months. The kind of experience which county agents have had before coming to their positions is indicated by the following figures: number of agents who have been farmers, 20; teachers and instructors, 17; assistant county agents, club leaders, and county agents in other States, 39; commercial positions, 7; miscellaneous, 6.

In the case of home demonstration agents, more than 83 per cent came to the service as experienced workers with previous experience either as teachers, social workers, or extension workers. About 16 per cent were inexperienced, but of these the majority served a short apprenticeship before they were permanently employed.

It is apparent that junior extension or club agents are drawn from the field of agricultural teaching more than from any other field. In a few cases, assistant county agents have been appointed county club agents. Either type of experience is valuable.

Salaries. The average beginning salaries of agents in this State are: agricultural, \$2215; home demonstration, \$1906; club agents, \$1830. The average salaries received by these groups of agents at the present time are: agricultural, \$2758; home demonstration, \$2207; club, \$2021. The minimum salary paid to agricultural agents is \$2000, and the maximum \$3600; the minimum salary paid to home demonstration agents is \$1800, and the maximum \$2500; the minimum salary paid to county club agents is \$1800, and the maximum \$2500.

The average length of service, to date, of county agricultural agents now employed is three years and three months. The average length

of time which agents who have left the service were employed was three years and seven months. In the case of home demonstration agents, the average length of service for the last five years has been somewhat less than eight months, although it has now risen to about ten months. Club agents show an average tenure of office of 17.4 months, but those who have already resigned averaged twenty-one months in the service.

Causes of resignation, and present employment. The numbers of county agricultural agents who have left the service to enter different lines of work are as follows: farming, 25; commercial concerns, 21; cooperative commercial enterprises and farmers' educational organizations, 14; supervisory work and extension service, 11; teaching, 2. These figures reveal ample faith in the business of farming and in farmers' cooperative enterprises. In most cases the change involved an advance in salary.

Though the average proportion of changes for home demonstration agents for the past five years is nearly 35 per cent, the changes show no abnormal causes. Of the 49 resignations, 12 were due to marriage, 10 to changes from one county to another, 6 to illness, 5 to a desire for further study and preparation, 4 to change of work for which the agents were better prepared, 3 to advancement to State positions in New York, and 3 to home demonstration work in other States.

In the case of the county club agents, the causes of change are difficult to tabulate. Several have left the work because they have found themselves unsuited to it. Most of the agents who have resigned are engaged either in farming or in some type of commercial work closely related to farming.

Recommendations. The information just outlined does not reveal any very serious weakness in the organization which it seems possible to correct. While the period of service, particularly for home demonstration agents and club agents, is much too short, the causes for this are not such as can be easily corrected. Earnest consideration should be given to the possibility of raising the salaries of agents who have given satisfaction in the service. The average salary of agents now in the service is at least 25 per cent lower than it should be where the service is satisfactory. In many cases salaries should be raised 50 per cent to make them comparable to salaries in equally exacting positions. These salary increases must come largely from the counties themselves, and unfortunately at a time when it is difficult to increase budgets. A careful study of these budgets, to learn where economies can be effected with a consequent saving to be used to increase the salaries of agents, should be made.

Farm bureaus

Farm bureau work has grown in strength and usefulness during the year. The duties of the county agent are more exacting than ever before, a higher type of service being required. The plan of training assistants in many counties has enabled the work to go on without serious handicap in spite of a considerable change in personnel. As an ideal, county agents should be farm-reared, should have had at least four years of training in some agricultural college of first rank, and preferably

should have had courses in an institution which would give them particular training for the position.

County and community extension programs during the year have been adapted to the agricultural conditions in which farmers find themselves. Emphasis has been placed on economical production rather than on increased production. Thought and effort have been directed toward helping the farmer to find a way out of the difficulty brought about by the prices of farm products being out of line with the prices of other commodities.

During the year the ideal has been "A definite program of work for each community in the State." This ideal is universally accepted. However, there is a wide difference in the degree to which the programs have been made and worked out. There are two fundamental steps necessary in each community: first, the decision on a program; secondly, the fixing of responsibility for carrying out the program.

As a means of stimulating the building of local programs and development of local leaders, the Central Office of Farm Bureaus made a careful analysis of the work done in each county in such a manner that one community was compared with another and the findings were brought to the attention of the county agent and the farm bureau executive committee. It was shown conclusively that the results obtained have a direct relationship to the manner in which the local program is made and the manner in which project leaders function in carrying it out. Community programs have been developed to some degree in every county in the State. Some of these programs are almost complete, while others are just getting a good start. In 1921 there were 551 meetings of community committees, with a total attendance of 4758; while in 1922 there were 988 meetings, with an attendance of 6700. Farmers are accepting responsibility for carrying out the programs in their communities, and are glad to contribute both time and effort to problems that are important from a community standpoint.

In 1922 the farm bureaus in the 55 agricultural counties received from local funds a total of \$493,978.64, as compared with \$478,458.38 in 1921. This is an increase of about \$15,500, or more than 3 per cent, over 1921. County boards of supervisors appropriated for 1922 a total of \$234,291.39 for farm bureau work, as compared with \$226,785.16 for 1921, an increase of about \$7500, or nearly 3½ per cent. Approximately one-half of the local funds come from supervisors' appropriations. A total of \$138,458.51 was received from memberships as compared with \$129,649.16 in 1921. This represents an average increase of about \$160 per county. A large share of the financial support is being assumed by farmers. Contributions from business corporations, chambers of commerce, granges, and other organizations, amounted to \$6907.34 in 1922, as compared with \$6490.32 in 1921. The receipts from advertising were \$40,835.42 in 1922, as compared with \$44,195.75 in 1921.

The total membership in the farm bureau was 42,426 in 1922, as compared with 49,511 in 1921, a decrease of about 7000. It is probable that the 1923 membership will about equal that of 1922. Counties are still in the process of changing fees. Thirty-one of the counties now have a membership fee of \$5, nineteen a fee of \$3, and five a fee of \$2. The

shortage of money on farms has no doubt had its effect in preventing the membership from reaching a higher mark.

One of the outstanding pieces of work during the year has been the continuation of the good-seed program. Its adoption by the farmers of the State is now becoming general. Varieties of corn, potatoes, and small grains developed by the Department of Plant Breeding of the College of Agriculture and introduced through demonstrations conducted by the farm bureaus are now in general use. A few farmers in every county are growing improved strains of seed for distribution to neighbors and others. The project reached a point where it was advisable to organize a new crop-improvement association to supervise the inspection and certification of seeds. This association will insure a more general distribution of inspected seeds of high quality than has heretofore been made.

A lime-legume campaign has been under way, and has been successful. In 1921 county agents reported that farmers used, as a result of their efforts, 15,078 tons of lime. In 1922 the figure is given as 32,852 tons. These figures are significant in that they indicate that farmers have doubled in a single year the amount of lime they are using. The amount employed since December has continued at the same or an increased rate. Associated with the increased use of lime has been the very materially increased use of alfalfa and clover seed of known origin. The amount of Grimm alfalfa seed used in the State is increasing rapidly. These changes in practice have a direct bearing on the more economical production of dairy products.

Farmers are realizing the value of the farm woodlot to a greater degree than ever before, and the interest in reforestation is increasing. The establishment of special forestry agents (for blister rust control) in several counties marks a new era in farm-bureau progress.

More value will be forthcoming to the communities as project leaders better understand their functions and accept greater responsibility for thinking through and carrying out local programs of work.

Home bureaus

Both quantitative and qualitative progress has been made in the development of the home bureau organization during the year 1922-23. The home bureau field staff now numbers 35 home demonstration agents and 9 assistants.

A total of 31,004 homemakers were organized in 36 county and 3 city home bureaus—an average of 795, the range being from 400 to 1444 in rural counties, with one city home bureau having 1951 members.

Two new county home bureaus have been developed, and one has been organized and financed to start work on July 1, 1923. Three additional counties have been organized which will seek to obtain county appropriations in the fall. Two counties that lost county appropriations last year have survived as organizations which will seek appropriations again. Two additional counties are starting organization, and several other counties are preparing to inaugurate the work. In short, the home bureau work has won public recognition, and its extension to all parts of the State is being asked for by the people.

The following figures indicate growth over last year: complete service operating in 34 counties and 3 cities; rural communities organized, 1046; home bureau county executive committee women functioning, 305; community committee women and officers, 3138; local financial support, \$106,597 from county boards of supervisors (average appropriation, \$3135.20), \$31,004 from memberships, total local support \$137,601.

Intensive work toward greater efficiency throughout the home bureau organization has been carried on, chiefly through the development of schools for training local leaders in administrative leadership under the direction of the College. There has been a clearer definition of the duties and responsibilities of the home bureau officers, committees, and local leaders.

Junior extension

Organization. Particular attention has been given during the year to the securing and training of local leadership in junior extension, to the end that young persons engaging in the work may have better instruction and closer supervision. A total of 1189 persons acted as voluntary local leaders during the year. Of these, 689 were teachers in the public schools and 500 were local residents pursuing other vocations.

A regular junior extension organization is now in effect in 23 counties. In four of these — Genesee, Ontario, Orange, and Tioga Counties — the work was started during the year. A fifth county which has in the past employed an agent on a part-time basis, has been placed under full-time leadership. In three counties the county agent has been employed on a half-time basis in cooperation with the state schools of agriculture located in these counties. Three counties employ two agents, one having charge of the work in agriculture and the other of that in home economics.

There has been a noticeable increase in the amount of local funds made available for junior extension work during the year. The total budgets in the 23 organized counties amount to \$94,505.70. Of this amount, \$14,250 was received as state aid under the township director-of-agriculture law, and \$13,350 was Lever funds provided through the State College of Agriculture. Boards of supervisors appropriated \$46,250. The remainder came from various local sources, such as county bankers' associations and local boards of education.

The total enrollment of junior extension workers for the year was 13,489, a decrease of approximately 1500 from last year. This, however, does not indicate a lessening of interest in junior extension work, but is a result, first, of a deliberate policy on the part of the county junior extension agents to limit enrollments to a number which can be adequately supervised, and secondly, of a definite state policy to discourage the enrollment of junior extension workers by teachers and others who are not in position to supervise the work during the summer months. The present plan of training local leadership should ultimately enable county leaders to enroll a considerably larger proportion of the young people in the county, and with reasonable assurance that they will receive more or less suitable instruction and encouragement.

The girls and boys out of school. A study of the enrollment in junior extension work during past years revealed the fact that practically 95 per cent of the workers are enrolled in the public schools and that

little attention has been given by county agents or local leaders to that large body of young persons who are living on farms but have left school. Accordingly, a survey was started in the various counties organized for junior extension work, to determine the number and location of these young persons. So far the survey has been confined to boys between the ages of fifteen and nineteen years. While the survey is still incomplete, the data from 189 rural-school districts taken at random in seven counties show a total of 754 boys between the ages of fifteen and nineteen years who are living on farms but are not in school. Of these, 499, or 66 per cent, are working at home on the home farm; 123, or 16 per cent, are working on farms away from home; and 132, or 17 per cent, are living on farms but are working away from home at some other employment. More startling is the lack of academic training as revealed by the survey. Of the 754 boys, 412, or 55 per cent, have less than an eighth-grade education; 342, or 45 per cent, have completed the eighth grade; 179, or 24 per cent, have attended high school; and only 26, or approximately 3 per cent, are high-school graduates.

In an effort to reach these boys there are being developed what are being called, for want of a better name, young farmers' clubs. It is the purpose of these clubs to encourage boys in the study and discussion of agricultural, community, and country-life problems. It is yet too soon to estimate the value or the success of this undertaking.

Scholarships. Six scholarships for the winter courses at the College were provided during the year, five by the New York State Bankers' Association and one by the American Agriculturist. These scholarships were for \$200 each and were available only to junior extension workers. The New York State Bankers' Association also continued its usual liberal appropriation for achievement pins, which has enabled the College to recognize each worker who has satisfactorily completed his project.

Office of Publication

The functions of the Office of Publication which are strictly extension in character are: (1) editing and printing extension bulletins, reports, and other material; (2) the news service to the papers of the State; (3) the editing and distribution of the *Extension Service News*; (4) correspondence courses; and (5) miscellaneous services.

News service. The year has seen a decided advance in the news and information services. Six separate services are now maintained for furnishing helpful facts to the public through the press: mimeographed news items prepared (1) for daily papers, (2) for weekly papers, and (3) for farm bureau publications; (4) timely information on farm and home topics, furnished each week to the Buffalo office of the Western Newspaper Union; (5) 1800 words of timely farm facts sent each week to a firm which supplies "ready-print" sheets to 48 western New York papers; and (6) a coupon by means of which a score of up-state New York dailies are each week offering college bulletins to their readers. During the year a total of 878 separate articles were offered through these services to newspapers and magazines of the State (as compared with 775 last year), with a total circulation of approximately 200,000,000.

Distribution of publications. During the fiscal year a total of

1,076,635 publications were distributed through the mailing room, as compared with 1,257,413 the previous year. A change in policy of distribution has evidently encouraged direct requests for the publications of the College. This is shown by the fact that during the fiscal year 42,912 communications requesting publications were received, whereas the previous year only 30,775 were received. At the close of the fiscal year, as a result of revision of its mailing list, the College had 58,355 names on its regular list as compared with 78,129 names at the beginning of the year.

Help for country papers. The office continues its work in the interests of the country newspapers of the State, in the belief that the country newspaper is in reality a most vital influence in rural life and one which greatly aids all other community institutions. A bulletin on the typography of the country weekly has been prepared and is ready for publication. The office has assisted, at district conferences and in other ways, in the organization of the country press of the State, has given lectures on the country newspaper, and has assisted in newspaper contests. The publication of the Service Sheet, which is apparently held in high esteem by the country papers, has been continued.

The cut exchange. The office operates a farm- and home-bureau cut exchange, which is a circulating library of engravings furnished by county agents and by the College for use in educational work throughout the State. At the close of the fiscal year there were 1677 cuts in the exchange, and during the year 565 cuts were loaned.

Farm study courses. Correspondence courses are becoming an integral part of the agricultural extension service. Four new courses, in sheep and wool production, vegetable forcing, beekeeping, and pork production, respectively, have been added during the year, and the Departments of Floriculture, Dairy Industry, Agronomy, Forestry, and Rural Engineering, have indicated that they look forward to preparing courses at the first opportunity. A new course in farm bureau organization is being prepared, designed to give farm-bureau community and county committeemen the information and practice that will make them efficient members of the organization.

During the year 302 persons were enrolled for ten courses. Of these courses, vegetable forcing was offered for the first time in April, and beekeeping, sheep and wool production, and pork production, in June. Enrollment in the other courses were: poultry husbandry, 148; farm management, 43; milk production, 37; orchard fruits, 21; vegetable gardening, 20; small fruits, 12.

Extension specialists read and graded 2613 reports on lessons and practical exercises received from students, as compared with 2307 in the preceding fiscal year. The total enrollment on June 30, 1923, was 310, as compared with 310 on June 30, 1922. During the year, 27 students completed courses as compared with 7 in the preceding year.

Farmers' reading series. The reading series continue to serve by furnishing information on agricultural subjects to residents of the State who lack either the opportunity to do the practical work required by the study courses, or the inclination to spend the time and effort that the study courses require. During the year, 2924 discussion papers were

received in the 864 series which had been started by residents of the State. On June 30, 1923, the eight reading series (farm crops, soils, home gardening, fruit growing, dairying, livestock, flower growing, and poultry) had an enrollment of 512. These series made use of 71 popular bulletins published by the College, and 18 Farmers' Bulletins from the United States Department of Agriculture.

Publications issued. The actual output of publications during the past year was exceedingly close to that of 1922. One less publication was issued, with 164 less pages but with over 100,000 more copies distributed. In other words, 74 publications were issued in 1923 as compared with 75 in 1922. They contained an aggregate of 3578 pages as compared with 3742 in the preceding year, and the total copies distributed amounted to 920,675 as compared with 819,000 in the preceding year. Figures for the complete output are given in the following tabular statement:

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
61 Some relations of organic matter in soils (Agronomy)...	27	3,500
62 Factors influencing catalase activity in apple-leaf tissue (Pomology)	19	3,300
63 The relation of soil moisture and nitrates to the effects of sod on apple trees (Agronomy and Pomology).....	28	4,000
64 Relation of the composition of rations on some New York dairy farms to the economics of milk production (Agricultural Economics and Farm Management)....	46	6,000
65 The nature and reaction of water from hydathodes (Agronomy)	11	3 000
66 Simplified apparatus and technique for the electrometric determination of hydrogen ion concentration in milk and other biological liquids (Agricultural Chemistry)..	16	3,500
67 Observations on the life history of <i>Taphrocerus gracilis</i> (Say) (Beetle, Family Buprestidae) (Entomology)..	13	3,000
68 Lepidoptera of New York and neighboring States (Ento- mology)	729	3,500
69 The morphology of the double kernel in <i>Zea mays</i> var. <i>polysperma</i> (Botany)	18	3,000
Total	<u>907</u>	<u>32,800</u>
EXPERIMENT STATION BULLETINS:		
411 The clover-leaf weevil (Entomology).....	12	7,000
412 An economic study of the production of canning crops in New York (Agricultural Economics and Farm Management)	82	8,000
413 The cabbage maggot, with special reference to its control (Entomology)	15	5,000
414 Cost accounts for six years on some successful New York farms (Agricultural Economics and Farm Man- agement)	139	12,000
415 Results of some experiments in pruning fruit trees (Po- mology)	75	7,000
416 Prices of farm products in New York (Agricultural Economics and Farm Management).....	63	17,000
417 The maple case-bearer (Entomology)	15	3,500
418 The clarification of milk for cheese making (Dairy Industry)	14	6,000

		Number of pages in printed publication	Number of copies printed
419	The apple-tree crotch: histological studies and practical considerations (Pomology)	22	5,000
420	Three little-known clover insects: the clover-head weevil (<i>Phytonomus meles</i> Fab.), the lesser clover-leaf weevil (<i>Phytonomus nigrirostris</i> Fab.), the clover-seed weevil (<i>Tychius picirostris</i> Fab.) (Entomology).	28	6,000
421	Economic studies of dairy farming in New York. I. Condensery milk without cash crops (Agricultural Economics and Farm Management).....	79	6,000
Total		544	82,500

READING-COURSE LESSONS FOR THE FARM :

114	(Reprint) Silos, and the production and feeding of silage (Animal Husbandry)	24	5,000
117	(Reprint) Computing rations for farm animals (Animal Husbandry)	69	8,000
123	(Reprint) Top-working and bridge-grafting fruit trees (Pomology)	24	2,000
130	(Reprint) Rearing chickens: brooder house construction (Poultry Husbandry)	27	5,000
137	(Reprint) The dairy herd (Animal Husbandry).....	20	5,000
156	(Reprint) Incubation (Poultry Husbandry).....	37	10,000
157	(Reprint) Feeding for egg production (Poultry Husbandry)	40	10,000
159	(Reprint) Forest planting on the farm (Forestry)	38	3,000
162	Judging horses (Animal Husbandry).....	40	6,000
163	Making butter on the farm (Dairy Industry).....	16	5,000
Total		335	59,000

READING-COURSE LESSONS FOR THE HOME :

85	(Reprint) The arrangement of household furnishings (Home Economics)	12	5,000
124	(Reprint) Making a budget (Home Economics).....	12	5,000
126	(Reprint) How to keep a cash account (Home Economics)	8	5,000
133	(Reprint) Use more cheese (Home Economics)	20	5,000
136	(Reprint) Food preservation (Home Economics).....	86	10,000
Total		138	30,000

EXTENSION BULLETINS :

21	(Reprint) How to select laying hens (Poultry Husbandry)	26	10,000
45	(Reprint) Cornell poultry rations (Poultry Husbandry)..	8	15,000
47	List of popular publications (Extension Service).....	4	110,000
48	(Revised reprint) Sewage disposal for rural homes (Rural Engineering)	25	8,000
56	Strawberry culture in New York State (Pomology)....	20	6,000
57	Soldering (Rural Engineering)	28	10,000
58	Diseases, and insect and animal pests, of the field bean in New York (Plant Pathology and Entomology).....	40	8,000
59	Directions for collecting and preserving insects (Entomology)	75	7,000
60	The extension organization and program of the New York State College of Agriculture, in cooperation with county farm and home bureau associations and county boards of junior extension (Extension Service).	12	5,000

	Number of pages in printed publication	Number of copies printed
61 The one-piece pattern (Home Economics)	8	3,000
62 Hitches, knots, and splices (Rural Engineering)	76	10,000
63 The extension service: an outline of the field organiza- tion (Extension Service)	54	12,000
64 Raspberries, blackberries, and dewberries (Pomology) ...	16	5,000
65 The farm bureau community committee and program of work (Extension Service)	32	10,000
66 Peach culture in New York (Pomology)	34	6,000
Total	<u>395</u>	<u>223,000</u>
JUNIOR EXTENSION BULLETINS:		
1 (Reprint) First lessons in sewing (Home Economics) ...	44	5,000
2 (Reprint) Elementary garment making (Home Eco- nomics)	28	10,000
5 (Reprint) Raising pigs (Animal Husbandry)	24	5,000
10 Food project programs (Home Economics)	28	4,000
11 Vegetable gardening for boys and girls (Vegetable Gar- dening)	35	10,000
Total	<u>159</u>	<u>34,000</u>
FARM BUREAU CIRCULAR:		
11 Otsego County: an account of its agriculture and its farm bureau (Extension Service)	29	10,000
RURAL SCHOOL LEAFLETS:		
September, 1922 (Rural Education)	132	20,000
November, 1922 (Rural Education)	84	120,000
January, 1923 (Rural Education)	40	110,000
March, 1923 (Rural Education)	58	120,000
Total	<u>314</u>	<u>370,000</u>
MISCELLANEOUS:		
Program of the State Extension Service, 1922, annual con- ference (Extension Service)	8	800
Farmers' Week program, February, 1923	40	10,075
Farmers' Week special program slips	16	5,000
Cornell Extension Service handbook (Extension Service)	280	500
Extension schools (Extension Service)	24	3,000
How to take a farm inventory and make a credit statement (Agricultural Economics and Farm Management)	19	15,000
How to keep an account with a crop (Agricultural Economics and Farm Management)	15	3,000
Nutrition project score cards for children (Home Economics) .	4	5,000
Junior Field Days program	8	2,500
Information for students	36	500
Total	<u>450</u>	<u>45,375</u>
ANNUAL REPORT FOR 1922 (in two parts)	<u>173</u>	<u>4,000</u>
ANNOUNCEMENTS:		
Announcement of courses, 1923-24	86	15,000
Announcement of winter courses, 1923-24	38	10,000
Announcement of the course in institution management	10	5,000
Total	<u>134</u>	<u>30,000</u>

SUMMARY			
	Total number*	Total pages	Copies
Memoirs	9	907	32,800
Experiment station bulletins.....	11	544	82,500
Reading-course lessons for the farm.....	10	335	59,000
Reading-course lessons for the home.....	5	138	30,000
Extension bulletins.....	15	395	223,000
Junior extension bulletins.....	5	159	34,000
Farm bureau circulars.....	1	29	10,000
Rural school leaflets.....	4	314	370,000
Miscellaneous	10	450	45,375
Annual report	1	173	4,000
Announcements	3	134	30,000
	<u>74</u>	<u>3,578</u>	<u>920,675</u>

* Including reprints.

A state policy in extension teaching

In every State in the Union, the state college of agriculture is recognized as the official head of the State's extension teaching system.. This is necessary, as the college is the recipient of the federal funds for the promotion of cooperative extension work, it administers the county agent system, and it is the State's highest institution for agricultural education. With the development of secondary state schools of agriculture, the need for clear and sound State policies in the development of extension teaching becomes highly important.

Experience has shown that extension work should be undertaken only by persons who are highly trained and are experienced in evaluating scientific work and in its interpretation. These persons need to be in constant contact with a background of active investigation. This work, because it requires specialists in a wide range of fields, is relatively expensive, and the staff of workers should therefore be limited to the needs of the State, without duplication. Farmers naturally turn to the State's highest educational institution for help on the majority of their problems. Furthermore, in order to avoid misunderstandings, such as would grow out of any attempt to fix zones of influence for various institutions and to limit projects to be undertaken, it is necessary that there be a uniform state policy and a single authority. Any State which failed to maintain a unified policy in extension work would soon find itself torn into competing sections, each pressing the Legislature for the largest amount of service, with a resulting waste of state funds. Experience in some States has established this fact. Fortunately, this general viewpoint has largely obtained in New York with officials of the State Department of Education and the directors of the secondary state schools, of which there are six.

In order to define specifically the relations which should exist among the institutions in this State, conferences were called in the fall and winter of 1922 by representatives of the State Department of Education and of the State College of Agriculture, acting jointly. These conferences were attended by the directors of most of the state schools, and by the county agricultural agents in the counties in which the state schools are

located. After full discussion and consideration a formal memorandum of agreement was drawn, which was signed by the State Commissioner of Education and the Dean of the State College, and by them recommended for approval to the trustees of the several schools and to the executive committees of the county farm and home bureau associations in the respective counties.

This memorandum endeavors to set forth a state policy with respect to extension teaching in agriculture and home economics. It recognizes that the state program in extension should emanate from and be supervised by the State College of Agriculture. After declaring that the State should not enter upon the policy of attaching extension specialists to the separate state schools of agriculture, it provides for participation on the part of such schools by their resident teachers in the extension activities of the counties adjacent to the schools, and links these schools much more intimately and helpfully with the extension organization and program than they have been linked hitherto. This agreement is more liberal in its recognition of the services of the secondary state schools than is the case in a number of other States having such schools. It offers a distinct step forward for all of the agencies concerned, and it should strengthen the cordial relations and the spirit of cooperation which have long existed between the state schools and the State College. The memorandum is herewith printed in full:

MEMORANDUM OF UNDERSTANDING BETWEEN THE STATE DEPARTMENT OF EDUCATION AND THE STATE SCHOOLS OF AGRICULTURE, AND THE STATE COLLEGE OF AGRICULTURE AND COUNTY FARM AND HOME BUREAU ASSOCIATIONS IN COUNTIES IN WHICH STATE SCHOOLS ARE LOCATED, CONCERNING EXTENSION ACTIVITIES

It is recognized that the Extension Service of the College of Agriculture, together with the County Farm and Home Bureau Associations and the State Schools of Agriculture, are public institutions whose prime objective is to serve the interests of country life. Because of this commonness of purpose, it is important to coordinate their efforts to the end that public funds may be safeguarded and the respective programs of the institutions may be promoted.

In order that there may be mutual understanding as to the activities and facilities of the above agencies, the following principles and details of cooperation are hereby mutually agreed to by the State College of Agriculture and the State Department of Education and are recommended to the several State Schools and county farm and home bureau associations concerned, to be operative in their respective territories when ratified by the respective schools and associations, in relation to both agriculture and home economics.

I. Extension service — a state policy

Extension work has two purposes: (a) supplemental education for persons now engaged in agriculture and homemaking, chiefly adults; (b) carrying to farmers and farm women directly the results of investigations involving new truths, or new facts with reference to agriculture and home economics. In the interests of developing a sound and reliable extension service program on a state-wide basis, and of preventing the duplication of administrative agencies and extension specialists and the consequent inefficient use of state funds, it is recognized that a comprehensive state-wide extension service program is both necessary and desirable. It is also recognized that such a state-wide extension service program should emanate from and be under the general guidance and direction of the New York State College of Agriculture, and that the State should not enter upon the

policy of attaching extension specialists to the staffs of the State Schools. Such extension work as the State Schools of Agriculture undertake should be limited to that which can be done incidentally in addition to the resident teaching and on the free time of the teaching staffs.

II. Utilizing the facilities of the State Schools

While the purpose of the State Schools of Agriculture is primarily to offer instruction of less than college grade to persons who desire to prepare for an agricultural pursuit, it is to be recognized that facilities of the schools are available to the people of the county for furthering the extension program. It is also recognized that the schools need wholesome contacts with their constituencies. Therefore, in order to accomplish these ends, to safeguard the use of public funds, and to promote cooperation, it is recognized that these institutions should cooperate in forwarding the state extension program. The following are suggested as some good means or ways of doing this:

1. *Ex-officio executive committee membership.* That the director of the school be an ex-officio member of the board of directors of the county association in the county where located.

2. *Conference of bureau representatives with school faculties and trustees.* That State School faculties and boards of trustees invite farm and home bureau chairmen or county agents to sit with them in conference on occasions when mutual interests are to be discussed.

3. *Preparing county projects.* That the school be represented on county project committees which formulate and help to carry out the county program of work.

4. *Junior extension work.* That the institutions cooperate in conducting junior extension work in accordance with the plans mutually agreed to between the State College of Agriculture and the State Education Department.

5. *Demonstrations on the school farms.* That so far as is consistent with the conduct of the agricultural and homemaking projects set up by a bureau, the school farms and laboratories should be utilized for tests, simple experiments, and demonstrations.

6. *Cooperation in field demonstrations.* That in the conduct of the extension projects so far as practicable in assisting in setting up and supervising tests, should be utilized so far as practicable in assisting in setting up and supervising tests, experiments, and demonstrations when these have been initiated and organized, and are supervised by the extension service and the county association.

7. *Farmers' meetings and lectures.* While recognizing that in general the State Schools will not engage in extension activities, occasions may from time to time arise when departure from this general policy may be advantageous to all concerned. A vital need in any such arrangement is that the school worker involved shall, to the fullest extent, harmonize his teachings with those of the authorized extension forces. This would involve mutual agreement in advance between the director of the State School, the county agent, and the head of the subject-matter department at the college responsible for the particular subject-matter concerned.

The physical facilities at the State Schools for accommodating groups of farmers and homemakers should be utilized to the fullest practicable extent. Also in planning farmers' weeks and other special group meetings for farmers and homemakers, county agents and school directors should cooperate and strive to coordinate their efforts to utilize to the fullest extent the facilities and services of the schools and bureaus.

8. *News publicity.* So far as is consistent with the policy of the associations, adequate publicity should be given through its publications to the activities of the schools, especially with reference to recruiting groups of pupils for the various courses and announcing activities of the schools of special interest to farm people.

9. That representatives of the schools should attend official state, regional, and district conferences of the extension service.

III. Visits of specialists

1. That when extension specialists from the College of Agriculture are in the vicinity of the State Schools, the school directors should be advised of the date of their coming and the duration of their stay in order that they may confer with them or possibly utilize their services if satisfactory arrangements can be made.

- 2. On the other hand, extension specialists from the College of Agriculture may be called upon by the school directors for special lectures or courses of lectures at farmers' weeks or similar occasions, or in connection with short courses. On such occasions the county agent should be advised of these arrangements — particularly the dates selected — in order that opportunity may be given the county agent to avail himself of whatever advantage may accrue from the specialist's visit to the county.
- 3. That the expenses of the representatives of the College of Agriculture, whose services are requested by the State Schools, should be shared on a fifty-fifty principle by agreement between the school director and the director of extension at the College.
- 4. That when specialists are used by both the county association and the school on the same trip, the proportionate sharing of the expenses should be a matter of agreement between the parties concerned.

IV. Prospective students

The schools will serve the interests of country life in proportion as young men and women avail themselves of their facilities. In accordance with the joint program now in progress by the State College of Agriculture and the State Education Department to promote "studying agriculture somewhere," special effort should be made to guide young men and women to the educational institutions where their interests will be served best. To this end, it is recommended that farm bureau officers and agents and members of the school staffs familiarize themselves with all school facilities for teaching, special adaptations to individual needs, and the entrance requirements of the several educational institutions designed to train young people for country life.

As means of promoting these ends, it is recommended that:

- 1. Copies of "Study agriculture somewhere" be put in the hands of every farm and home bureau committeeman, and that they be requested to put them in the hands of young men and women who should be interested.
- 2. Association officers be invited to hold their district conferences at the schools and to study their facilities.
- 3. County agents be invited to address the school students on current farm problems in the extension program, with a view to interesting students in farm and home bureau work after leaving school.

V. Cooperative employees

That the extension service and the county associations give consideration to the desirability and feasibility of employing properly qualified school instructors who are usually best utilized by the school during the six-months course, as assistant county agents during the remainder of the year, such persons to be under the direction of the extension service and the county association when so employed.

(Signed) FRANK P. GRAVES,
For the State Department of Education.

Dated March 29, 1923.

(Signed) A. R. MANN,
For the State College of Agriculture.

Dated Feb. 27, 1923.

Accepted for.....County.
.....
For.....County Farm and Home Bureau
Association.
.....
For State School at.....
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Agricultural Chemistry

The principal extension activities of the Department of Agricultural Chemistry during the current year were connected with the analysis and examination of samples of various materials received. Prior to the estab-

lishment of the New York State College of Agriculture, Cornell University maintained in Morse Hall a chemical laboratory under the auspices of the Cornell University Agricultural Experiment Station. This laboratory undertook problems connected with the development of agricultural chemistry both at the College and throughout the State. With the establishment of the State College the laboratory became a part of the Department of Agricultural Chemistry, and, as such, has functioned as a part of the Extension Service of the College. A summarized report covering the period from January 1, 1911, to June 30, 1923, is given in the accompanying table. During that time 4022 samples of various materials have been received and examined. The table shows the kinds of materials and the number of samples, which came from 1861 individuals representing every county in the State and several localities outside the State.

Material	Number of samples
Air	2
Alkalies	4
Apples, evaporated	30
Ashes, coal	16
Ashes, wood	38
Bacteriological cultures	252
Beets, mangel	5
Beets, sugar	44
Butter	8
Canning compounds	5
Chemicals	4
Eggs	46
Feeds	365
Fertilizers	283
Flour	19
Foods and beverages	43
Fungicides	29
Insecticides	32
Lime	85
Limestone	456
Manures	60
Marl	146
Milk	250
Miscellaneous	71
Muck	138
Oils	12
Poison cases	99
Remedies	15
Rocks and minerals	142
Soil	1,107
Vinegar	165
Water	51
Total samples	4,022

Agricultural Economics and Farm Management

Lectures on rural economics. The subjects most commonly discussed at lectures given the past year by the Department of Agricultural Economics and Farm Management, were prices of agricultural products, and why some farms pay better than others. The subject of prices of agricultural product, or some closely related phase of it, was probably discussed at three-fourths of these meetings. The majority of the lectures

by the extension specialists of the department were given at community meetings held under the auspices of the county farm bureau. A number of lectures, however, were given at other meetings, such as rotary clubs, business men's associations, annual meetings of a farm bureau organization, and so forth.

The department has conducted during the year, in cooperation with various other departments, 8 extension schools making 1158 personal contacts. Each of these schools had three- or five-days sessions. The extension specialist in farm management conducted the work for a period of from one hour to one and one-half hours during each half day. The extension specialist in the cooperating department did an equal amount of work.

Community meetings are used largely by this department to get farmers acquainted with the subject matter of farm management and to prepare communities for more definite project work later. In some cases community meetings are held for the purpose of furthering a definite program in farm management which has already been adopted by the county.

During the year six project meetings were held, which were attended by 55 county or community project leaders.

Farm-management tours. Tours for farmers were first conducted by this department in the summer of 1921. As a result of four tours held that summer, more work was planned for the summer of 1922. This year twelve tours were held, with a total number of contacts of 2832. The farm-management tour seems to be one of the most effective ways of teaching the principles of good farm organization. A special record card has been developed for the use of each person who attends. These record cards are filled out by each farmer at each stop. Some of the data on the card are summarized by the extension specialist at various times during the day.

Conferences. Various members of the department held 27 conferences, with a total of 184 persons in attendance. These conferences were generally planned to discuss subjects pertaining to the business side of farming, the marketing of farm products, or methods of conducting extension work in these subjects.

Personal work with farmers. Members of the department visited a large number of farmers during the year. The greater proportion of these visits were made in connection with the gathering of farm-management survey records. This work serves the purposes of both extension and investigation. The farmers who have supplied these data state that it is well worth while for them to spend their time giving the information because of the analysis of their own farm business that they have to make in order to answer the questions asked by the investigator. The remaining farm visits were to farmers who were cooperating in the special farm-management service, and to farmers with whom special problems had arisen in which the help of the department had been requested. In addition practically every member of the department receives many office calls and personal letters in relation to the business problems of farmers. In many cases this involves a conference of from one to three hours, with a detailed study of the farm business. Several hundred farmers are assisted in this way during the year. This work includes problems

of business organization, systems of farming, rotations, farm layouts, building arrangement, marketing, and many other business problems.

Farmers' institutes. Two extra men were employed on part time during the months of December, January, February, and March, on farmers' institute work. Both men are graduates of this College who are now engaged in practical farming. In the interim between graduation from the College and the beginning of practical farming, both were engaged in teaching and investigational work in other States — experience and training which make them ideally fitted for institute work.

This department considers the farmers' institute as a definite part of the regular extension program. The talks and discussion periods at these institutes serve as the introductory work for a more definite and permanent extension program in the county later. In some cases the institute is used to strengthen a program or to help in developing more definitely a program already established. For these reasons the department considers it necessary that the institute workers should be thoroughly trained, thoroughly acquainted with the research, teaching, and extension work of the department, and able to coordinate their work with the other work of the department.

During the year 97 farmers' institutes were attended, with 1690 teaching contacts.

Farm accounting. The work in cost accounting was conducted on the same basis as in former years. Cost accounts were started on 37 farms and closed on 32 farms. The accounts were summarized, detailed analyses were made, and the results were returned to the cooperators. These results are used in extension schools, community meetings, and institutes, are published in the county agents' handbook and thus made available for use by every county agent and extension worker in the State, and are mailed or given to many individual farmers and others who desire data on farm problems.

During the year 625 account books were distributed to farmers at cost. Instruction in farm accounting was given in the regular extension schools, and to some extent at farmers' institutes.

In October, 1922, there was prepared and printed a new publication entitled *How to Take a Farm Inventory and Make a Credit Statement*. Approximately 8000 copies of this book have been distributed to farmers through county farm bureaus, bankers, and farmers' meetings, and as a result of direct requests. Considerable publicity was given to the book, and as a result the College has had a very large number of direct requests for copies from individual farmers.

In February, 1923, a new publication entitled *How to Keep an Account with a Crop* was prepared and printed. No attempt has been made to give a wide distribution to this book, as only 3000 copies were printed. The book is being used largely as the basis of farm-management project work in many counties where the work is organized definitely on a project basis. In this way several hundred farmers started accounts with individual crops in the spring of 1923.

Farm-management service. Nine farmers in Genesee County, each a project leader in his community, enrolled for the farm-management service in 1923, each paying a fee of from \$10 to \$15. The department

made a survey and a map of each of these special service farms. The buildings also were mapped whenever a building-arrangement problem was involved. A study of the business organization of each farm was made, and the specialist in farm management then met each of the cooperators in the early winter and conferred with him for a period of several hours in regard to his special farm problems. At these conferences suggestions were made for changes in the farm business organization, changes in farm layout, changes in building arrangement, and various other things. These suggestions were later confirmed in writing.

Farm-management study course. The farm-management study course now has an enrollment of 56 students. Seven students have completed the course and have received their certificates. This correspondence-course work is one of the most satisfactory parts of the extension program of the department.

Junior project in farm accounting. In 1922 one group of five boys was organized for junior project work in farm accounting. During the past twelve months a few of the junior project leaders have requested help that it has been impossible to give.

Niagara County survey. Records of the farm business in Niagara County were obtained from 171 farmers during the summer of 1922. These records and analyses of the business have now been returned to these farmers. The work is being continued for the tenth consecutive year.

Dairy farm survey. During the summer of 1922, in cooperation with the United States Department of Agriculture, farm dairy records were gathered from 552 farmers in Chenango, Madison, Jefferson, Cortland, and Onondaga Counties. These records were gathered from several different types of dairying, including farms producing milk for condenseries, for cheese factories, for Grade A market, and for Grade B market. Data were obtained which made it possible to compute labor income, cost of milk production, cost of raising young stock, and many other factors involved in the farm dairy business. This is the most complete study of the business of dairy farming that has ever been made. The work was continued in the same areas during the spring of 1923. The value of the study from the extension standpoint has already been discussed in this report.

In June, 1923, the extension specialist held a series of five meetings in Chenango County to carry back to groups of farmers the results of this special study. The groups met varied in size from four to sixty persons. The work was satisfactory enough so that it will probably be continued in other areas as time will permit.

Determining the cost of maple-sugar and maple-sirup production. This department, in cooperation with the Department of Forestry, has cooperated with about forty-six farmers in the keeping of accounts to determine the cost of producing maple products. Forty-three accounts were received at the department during the past year. These were studied and analyzed, and the results were returned to the farmers.

Price service. The readjustments from the period of inflated currency are particularly injurious to agriculture because so large a part of the farm expenses are fixed charges and because agriculture has such

a slow turnover. The price question is therefore of great importance to farmers. A monthly price service is mimeographed and distributed to county agents, farm bureau committeemen, and some of the papers that give special attention to agriculture. Only a limited number can be issued, but the data are quoted so that many farmers get them.

Agronomy

There are two main subdivisions of extension work in the Department of Agronomy — soil management, and field-crop production. The activities in these groups may be summarized as follows:

A. Soil management:

1. Identifying soil types and advising on adaptabilities.
2. Lime — where, when, and how to use it; the forms, composition, and sources of lime, and the bases of selection.
3. Fertilizers and fertilizing materials — their composition and uses; how to select mixed fertilizers, and the quantities to use; how to buy fertilizing elements and combine them at home; relative values under varying conditions.
4. Farm manures — composition and relative values; how to use various forms; how best to combine them with other fertilizers; the care and conservation of manure; storage and handling.
5. General care and management of soils — crop rotations; tillage and cultivation; drainage; the interrelationships of soil management to economy of production; how to maintain productivity.

B. Field-crop production (general and specific advice with reference to forage and cereal crops):

1. Leguminous crops — factors for success in growing them; relative place and values of alfalfa, clover, sweet clover, vetch, soybeans, and other leguminous crops; seed sources.
2. Silage corn — rate of planting, cultivation, harvesting.
3. Meadows and pastures — seeding mixtures for various conditions and purposes; cultivation and management.
4. Soil-improving crops (cover crops), and how to grow them.
5. Small-grain production.
6. Weed eradication.

During the past year special emphasis has been placed on the importance of growing more and better legume crops in New York. This phase of the agronomy program for the year has been developed in cooperation with the Department of Animal Husbandry and the Department of Agricultural Economics and Farm Management, as a part of the "Better Dairy Farming Campaign." In the furtherance of this cooperative project, it has been necessary to emphasize the projects which have to do with successful legume production, such as lime, fertilizer, alfalfa, forage-crop production, pasture improvement, small-grain production, and soil improvement through crop rotation.

The methods emphasized can be classified under the following headings:

1. Teaching through lectures at various types of meetings, such as schools, institutes, tours, and the like. There were 416 such lectures given, which were attended by 11,576 persons.

2. Teaching through field demonstrations, aiding county agents and farmers to lay out demonstration plots in accordance with a definite plan, and at the appropriate seasons meeting farmers of the neighborhood in the field to point out the results of demonstrations. There were 25 such demonstration meetings, attended by 119 persons.

3. Correspondence with farmers and county agents, covering the widest variety of subjects on soil and crop management. There were 16 circular letters written with a circulation of 1035, and 2931 letters in regular correspondence.

4. Conferences with county agents and other collaborators with representatives of the fertilizer industry, limestone manufacturers, and railroads, to advise in the development of community programs, to establish and inspect field demonstrations, to help solve special soil and crop problems, to assist farmers in getting better fertilizer at less cost in the interests of all concerned, and to assist in the establishment of hay grades. For such purposes 44 conferences were held, with 463 persons present.

5. Personal assistance to county agents and farmers through farm or county visits on specific problems. There were 323 such inspections and farm visits.

6. Preparation of articles for publication, including extension bulletins, leaflets, lantern-slide lectures, and a monthly news service. There were 57 articles written.

7. Additional miscellaneous service included furnishing 6 exhibits, examining and reporting on 325 samples of soil submitted, and service to cooperators, especially the Grange League Federation and other dealers in their purchase and handling of fertilizers.

Illustrations of the known results of extension teaching efforts follow:

1. As a direct result of two meetings held by an agronomy specialist, the Schenectady Vegetable Growers' Association changed its order on three carloads of fertilizer from 4-8-4 to 5-10-5. In Genesee County a two-carload order was completely changed by substituting acid phosphate and high-analysis mixed fertilizer for low-analysis and high-potash mixtures, as the direct result of a single fertilizer meeting held by a specialist. In Madison County a carload order of fertilizer was changed in accordance with the specialist's recommendation.

2. The lowering of the freight rates on agricultural limestone on the part of most of the railroads operating in the State was due in part to the activity of the agronomy extension specialists in cooperation with the State Federation of Farm Bureaus.

3. In Genesee County 250 farmers are establishing a rotation system and a fertilizer practice on a part or the whole of their farms, as outlined by agronomy extension workers.

4. There are numerous instances that might be cited, in which alfalfa has been seeded in accordance with the specialists' recommendations. Also, in most of the counties there has been an increase the past year in the acreage of grain mixtures seeded in preference to oats alone. In Montgomery County ten farmers are known to have seeded peas with oats for the first time this season.

Animal Husbandry

Dairy cattle. In the extension work with dairy cattle conducted by the Department of Animal Husbandry, chief emphasis was placed on feeding and disease control. One phase of feeding was made a joint effort between several departments in a lime-legume-livestock campaign, designed to reduce cost of production. The regular monthly feeding

service to the Farm Bureau News of the various counties was continued, supplemented by many personal letters.

The livestock survey is being continued. Last year 122 townships were covered, in which 1413 purebred bulls, 1277 grade bulls, and 931 scrub bulls, were enumerated. In these townships there were 268 purebred bulls purchased to displace grades, and 226 persons made their first purchase of purebred cows.

Disease control was aimed mainly at bovine tuberculosis, the control of which is the largest single livestock project in the State. The State Department of Farms and Markets handles the testing and control features; the College contributes general education and moral support, and assists in organization; and county agents often act as local leaders and organizers in counties. There has been a striking gain during the past year, 109,872 animals having been tested, among which 15,431 reactors, or 14 per cent, were found and eliminated. There were 11,418 herds under supervision, of which 5456 have passed one clean test and 1036 have been accredited.

Better stock continues to be a major objective. The dairy improvement associations are one of the means to this end. There were 33 such organizations in operation during the year. Membership in these totaled 1380; cows tested, 15,593; cows discarded as result of tests, 854; balanced rations calculated, 1217.

Sheep. Records were kept on 19 demonstration flocks of sheep in four counties, primarily to show costs of production. The wool pool has operated effectively, with 348,813 pounds of wool cooperatively marketed.

A summarized statement of the extension activities of the department follows:

Oral instruction:

1. Detailed instruction in thirty- to sixty-minute lectures in different localities. on principles of feeding, breeding, and improvement of livestock.
2. Instruction on the prevention of disease.
3. Instruction on what to do in case disease appears.
4. General instruction in schools.

Total, 382 lectures before 10,022 persons.

Demonstrations on farms and in barns of owners of animals:

1. Selection of animals for quality or production.
2. Detection of disorders or disease.
3. Instruction on how to combine feeds in a ration.
4. Prevention of growth of horns on calves.
5. Disinfection of the navel of newly born calves.
6. Treatment for common ailments, such as stomach worms.

Total, 149 demonstrations before 7256 persons.

Personal service by conference and farm visits:

1. Specific advice on feeding under conditions indicated.
2. Selection of sires and dams for special service.
3. Treatment for ailments, parasites, and other disorders.
4. Instruction on how to put in a water supply.
5. Stable arrangement:
 - How to ventilate.
 - How to get the required amount of light.
6. Sources of breeding animals.
7. Prices of livestock.
8. Sources of special supplies.
9. Location and instruction of testers.

Total, 323 farm visits.

Organization :

1. Creation and supervision of new dairy improvement associations and dairy improvement clubs.
2. Assistance in organizing county breeding clubs.
3. Information on forming accredited-herd associations.
4. Work with wool-growers' associations.
5. Conferences with county veterinary associations.

Total, 63 conferences with 577 persons.

(The field work listed here involved 470 days in the field, exclusive of 83 days additional consumed in travel.)

Correspondence :

1. Letters on every conceivable aspect of animal husbandry.
2. Farm study courses, grade papers, and answers to questions asked.

Total, 2660 personal letters, and 25 form letters sent to 1308 persons.

Information material:

1. Preparation of bulletins.
2. Lessons for junior club leaders.
3. Regular farm bureau news service.
4. Special articles to trade papers.

Total, 43 articles written, comprising 72 pages.

Miscellaneous:

Judging contests — for vocational schools, state schools, junior club members
Farmers' Week, Field Days, and so forth.

Beekeeping

The work in apiculture was directed largely along the following lines:

1. Raising the educational efficiency of the beekeepers' organizations. The programs of the beekeepers' associations in the State included generally a winter business meeting, a summer picnic, the cooperative purchasing of supplies, and the recommendation of minimum prices for the honey. The main problems (which were found to vary in different sections of the State) were studied with the beekeepers, and programs which included plans for attacking the problems were formulated, in many cases before the meeting adjourned. Twenty-eight associations were interested in enlarging the scope of their programs. Problems attacked were on disease control, marketing, better stock, and organization.

2. Lectures on beekeeping. Usually the specialist is invited to attend and address meetings of beekeepers' associations held in this State. Such requests resulted in 61 lectures, at which subject matter on good beekeeping practices was presented to an aggregate audience of 2933. The topics emphasized were queen rearing, wintering of bees, elimination of non-productive colonies, disease control, and facts about honey. Several requests have come from associations for a printed copy of the lecture on the last-named subject.

3. Demonstration meetings. Seven beekeepers' organizations included, in their programs of work, demonstration meetings to be conducted by the specialist. In these localities and including other cases, 27 apiary demonstrations before 422 persons were given, in queen rearing, swarm control, treatment for four-brood disease, and transferring.

4. Apiary visits. In response to requests from individuals for advice, and where opportunity afforded occasion to visit successful commercial honey producers, apiary visits were made. These totaled 64 and were usually made tributary to a field trip for other purposes.

5. Poisoning investigations. Ten days in the spring of 1923 were devoted to making observations of the arsenical poisoning of bees in the western fruit counties of New York. Data were taken on colonies before and after the application of arsenical dust, and samples of dead and dying bees were sent to Washington for diagnosis of the diseases of adult bees and to our own chemistry department for analysis as to arsenic content. The investigation set at rest the discussion as to whether the bees actually died of arsenical poison, and enabled the specialist to recommend that bees be moved away from the flight area of dusting machines during the dusting period as the only preventive measure for the beekeepers at present. A repellent that will keep bees from taking the dust, with a law making the use of such repellent compulsory, seems to be the only solution to this problem.

6. Cellaring service. Telegraphic reports were sent to secretaries of 20 county and regional beekeepers' associations announcing when the weather forecasts indicated the time to be right to put bees into the cellar in the fall and the time to take them out in the spring. This is a new service to New York beekeepers, and is done in an effort to minimize winter losses of bees caused by exposure that may be averted by careful temperature forecasts made four or five days in advance. Beekeepers were pleased with this service, which was made possible by the cooperation of the local office of the United States Weather Bureau.

7. Short course. A four-days short course for commercial beekeepers was held at the College in February. Fifty beekeepers were registered.

8. Conferences. Thirteen conferences, with an attendance of 94 persons — mainly county agents and project leaders — were held to discuss local programs in bee culture.

9. Articles and letters. Ten articles on bees and honey were prepared for the Farm Bureau News service and the press. Fifteen circular letters were written to county agents and association secretaries, and 1085 personal letters were written, the majority of these being in reply to requests for information in regard to bees.

Botany

The extension work of the Department of Botany during the year was practically confined to the preparation and distribution of inoculation cultures for leguminous crops, and answering letters of inquiry concerning inoculation and identification of plants. About 10,000 cultures were sent out. A nominal charge to cover the cost of materials is made for these cultures. Letters of inquiry to the number of about 550 were received and answered. In addition, lectures were given during Farmers' Week.

Control of diseases and pests

Spray service

Chief emphasis in extension work in the control of insects and plant diseases has centered about fruit and potatoes. The most important single method employed is field-assistantship work, over which the Departments of Plant Pathology and Entomology have joint supervision, covering twelve counties served by ten assistants located in the principal fruit

and vegetable-growing counties. These assistants have charge of all demonstration work in disease and insect control in their respective counties, giving the growers timely information regarding the spraying and other operations necessary for the protection of their crops. The United States Weather Bureau cooperates by sending from the Ithaca office to each county in which this spray service is conducted, a special forecast each night during April, May, and June, as a guide in giving specific advice on when to spray. In addition to these counties maintaining a special field assistant, the county agents in four other counties are maintaining a similar service. All receive from the College supervision consisting of regular visits from the leaders of the project, answers to inquiries, maintenance of a weekly news letter for their information, and such other help as is necessary for the proper conduct of the service.

A vital feature of the special spray service is the maintenance of criterion orchards or fields scattered through the counties, in which, by rigid agreement with the owners, spraying operations are conducted exactly in accordance with the advice of the field assistants. These farms then serve as demonstrations to convince growers who are not actively cooperating in the service. Other demonstrations, such as pruning and fertilizing, are also carried on at these criterion orchards and fields.

Further proof for the skeptics is provided through cooperation with the packing-houses, in showing correlation between the spray service and the percentage of high-grade pack, in comparison with fruit brought to the packing-houses by growers not following the advices of the spray service. Such figures are very convincing.

The nine field assistants serving during the summer of 1922 traveled 51,535 miles, made 5074 visits, conducted 191 demonstrations at which 2160 contacts were made, prepared 156 circular letters having a circulation of 54,746, wrote 1295 other letters, and published 151 articles in newspapers and the Farm Bureau News of different counties.

Plant Pathology

Potato-improvement work conducted by the Department of Plant Pathology consists of demonstrations in seed treatment, soil treatment with sulfur to prevent scab, spraying and dusting, and maintaining seed plots; seed-source, variety, and strain tests; talks at field meetings, tours, community meetings, and extension schools; and the maintenance of a potato-inspection service. No actual seed-treatment demonstrations were conducted in the past year, but leaflets describing the treatment were sent to each county agent. Special assistance has been given to seed dealers who wished to treat the stock they sell. Nearly all stock planted for the growing of seed is treated. It is impossible to give even an estimate of the amount of seed treated, but it is safe to say that the practice has increased many fold during the past few years and has become well established among potato growers and among many growers of table stock.

The application of sulfur to the soil before planting, as a means of controlling scab, was tried in 28 demonstrations in Nassau and Suffolk Counties last year, with satisfactory results where the plots had been carefully laid out.

Twenty-three potato spraying or dusting demonstrations were conducted, with 340 persons in attendance. No effort has been made to

forward the dusting method in preference to spraying, but every opportunity has been taken to give growers the information about dusting when they have requested it.

A considerable amount of time has been spent in demonstrating the value of high-grade seed potatoes. Six seed-source tests were conducted in Suffolk and Orange counties this year. Many of the growers of the ninety or more strains of seed used in the test last year attended the annual demonstration tour, and each had an opportunity to observe how his strain compared with the others. Hundreds of growers and dealers from New York, neighboring States, and Canada regularly attend these meetings. As a result of the tests, the Long Island growers are becoming more discriminating in their choice of stock and the seed growers are finding it necessary to be more active in seed-improvement work in order to hold their market.

Seed growers and other potato growers are being instructed in good seed by means of variety tests conducted in cooperation with the Department of Vegetable Gardening at the College. During the past year 53 such tests have been conducted, in 20 counties. A plant pathologist made one inspection of each test, a field meeting often being held by the county agent at the time when the inspection was made. There were 24 variety-test inspections, and 16 potato plots were rogued for diseases. There can be no doubt that the variety tests conducted during the past four years have been an important factor in introducing better seed into the localities in which they have been held.

In answer to a number of complaints of losses due to black leg of cabbage, a considerable effort has been made to help the situation through trips, meetings, and news items prepared to give information on control of the disease.

Requests for bean inspection were received during the year, and a number of fields were visited to determine their suitability for bean-seed production from the standpoint of freedom from disease.

The control of tobacco wildfire has been attempted in a demonstrational way in Chemung County, where two growers have cooperated and many others are following the instructions given.

Plant-disease survey work has been continued in cooperation with the United States Department of Agriculture. This survey work is important because it affords information that helps in determining the relative importance of the various plant-disease control projects.

Two industrial fellows are doing special research in the field. These men make incidental contribution to the extension work in the communities in which they are located.

Teaching enterprises not credited in the foregoing paragraphs to any particular phase of the service include: 63 conferences attended by 338 persons; 56 lectures before 2610 persons; 91 field meetings, with an attendance of 2316; 608 farm visits; and 2 demonstration schools of 3 days each, making 137 contacts. In addition, 2921 personal letters were written; 33,657 leaflets were sent out in answer to inquiries; and 24 news articles and 3 circular letters were prepared.

Entomology

The principal extension activity of the Department of Entomology is supervision of the spray service through the special field assistants, already described.

In order to be able to give reliable advice as to late seeding of wheat to avoid infestation by the hessian fly, an examination of wheat fields was made in July in order to determine the infestation already present as a basis for forecasting the danger to be expected from the insect. The results of this examination were sent to all county agents before seeding time.

Various services are rendered to florists, gardeners, homemakers, and others, in the way of identifying and suggesting means for control of all sorts of troublesome insects, including not only those that destroy plants but also animal parasites and insects that are troublesome to man. This work is accomplished mainly by means of letters, circulars, bulletins, news articles, lectures, and demonstrations.

The winter months are devoted to attending farmers' meetings, extension schools, meetings of fruit-packing associations, and other gatherings. The object in these winter meetings has been to pave the way for an effective spray service wherever local conditions warrant it. A total of 80 such meetings gave 1619 teaching contacts. In addition, 212 farm visits were made. In the office 2075 personal letters were written, many of them involving hours of microscopic study; and 16 articles were prepared, aggregating 53 pages.

The Department of Entomology includes also service to beekeepers, which is reported elsewhere.

Ornithology and mammalogy

Extension work in ornithology and mammalogy during the year 1922--23 has been carried on by means of lectures, demonstrations, and correspondence. Twenty-five lectures, with a total attendance of 8285, were given before granges, schools, home bureaus, bird clubs, sportsmen's organizations, and so forth. These lectures were illustrated with colored lantern slides or motion pictures, and emphasized the relation of birds to agriculture and the methods of increasing beneficial species and controlling destructive ones. The migration and home life of birds was likewise used as a means for stimulating interest. The conservation of the game resources of the State was discussed before sportsmen's organizations, and the control of destructive mammals formed the subject in localities where such assistance was requested.

Demonstrations in the bird work consisted in trips afield for the observation and identification of birds. These trips were largely conducted with school children or in connection with some public lecture. For mammals, the extension work was arranged through correspondence and news letters, and consisted of recommendations as to the best methods of eradicating woodchucks, rats, meadow mice, moles, and ground squirrels.

About 140 letters were answered, dealing with every phase of the work and widely distributed throughout the State. Six general articles, aggregating 57 pages, were published, and a number of news letters were furnished.

Dairy Industry

The extension work of the Department of Dairy Industry has to do with the handling and processing of dairy products from the time when the milk is taken from the cow. The service rendered falls under two main groups: (1) that related to the manufacturing of dairy products or to commercial problems; and (2) that related to city milk supplies.

Extension service to the dairy manufacturing plants consists of personal visits and of advice by letters, bulletins, preparation of plans and blueprints, and laboratory analyses of samples of milk or milk products. The work of the past year has emphasized the need of definite research, much of which should perhaps be done at the commercial plants. Most of the calls were from cheese factories, for help in improving the quality of the finished product. The growth of the ice cream industry is presenting new problems that demand attention. Some work has been done also at butter factories, particularly those operated by former short-course students who experience trouble from time to time with problems of quality, neutralization, overrun, and the like. During the year, 85 days were given to visiting 110 manufacturing plants, for the purpose of advising with superintendents and employees on many problems of processing, some of which reach back to the milk producer and correlate with other extension projects.

The control and improvement of city milk supplies constitutes one of the outstanding problems in the extension work of the department. A beginning has been made in two cities and one village. The objects are, primarily: to carry to the consumer facts regarding the meaning and the purpose of grades, pasteurization, certification, and ordinances; to carry to the producer information regarding the proper care and handling of milk on the farm; and to assist in the adoption of better standards of quality in market-milk production. Inasmuch as one of the most important problems of the dairy industry of New York is the increase in consumption of fluid milk, this work is of great importance, since the amount of milk which consumers will use is directly dependent upon its quality and the confidence of the public in it. Both of these conditions are directly dependent on methods of production and handling as shown by the bacteria content and the flavor of the milk. If a demonstration can be made of the improvement of the quality of the milk supply of a few communities, and the consumption of milk thereby increased, a foundation will thus be laid for a piece of work of immense value to the dairy industry, including the producer, the dealer, and the consumer.

Mainly on this and related subjects, 51 lectures were given before 2111 persons, and one school was held with 72 teaching contacts. The first real project was started at Glens Falls, where 140 samples of milk were graded, 15 barns were inspected, and addresses were made before groups of consumers (548 contacts in all) and before the producers (120 contacts in all).

Inability to make bacteria counts in small villages constitutes a limiting factor in improving the quality of milk. It is impossible to obtain reliable results on samples expressed or mailed to the College. To meet this problem, a beginning has been made in training the farm bureau agent.

or some one designated by him, in the preparing of milk samples for microscopic examination. These preparations are sent to the College for study.

One of the most important projects undertaken by the department is the grading of milk at plants where complaint has been registered against the quality of the milk. Samples are taken from each can as it is received at the plant. These samples are graded, the results are discussed at a general meeting, and remedies promptly follow. During the year, 1764 samples of milk were graded in the field. Work of this character was done at five new plants, and two other plants were checked up.

Numerous requests are made for plans for milk houses (oftentimes for plans based on the ideas of the dairyman himself), and also for plans for small dairy plants where from 200 to 500 quarts of milk are bottled. Information is sought regarding milking machines, the best outlet for surplus milk, standardization, causes of a short cream line following pasteurization, variations in fat test, off flavors in butter and cheese, kinds of machinery to install, cooling of milk, putting up of ice, and the like.

A summary of the more important office and laboratory duties indicates that 1078 samples of milk and cream were tested for butterfat at the department during the year, 5313 letters were written, and 25 articles or plans were prepared.

Floriculture and Ornamental Horticulture

The purpose of extension work in the Department of Floriculture and Ornamental Horticulture is to help make life in the open country more attractive, and enhance the value of public and private properties through better arrangements of buildings and grounds and more attractive planting of trees, shrubs, vines, and flowers. Both the lecture and the demonstration method are employed. Lectures are usually profusely illustrated by lantern slides, showing before-and-after appearances of simple, inexpensive plantings about rural school grounds, village parks, farmsteads, and other properties. The keynote of advice given is simplicity and utilization of native species. There were 59 lectures given, with an attendance of 3554 persons.

Following the lectures, which are mainly for the purpose of coordinating individual efforts or aims into community action and explaining in general terms what materials to use, how to place them, and the approximate costs, and answering other questions, a demonstration for the community is sometimes requested. Some public or quasi-public property is selected, and the specialist superintends the actual plantings, grading, and so forth, various members of the community cooperating in the labor. Five such demonstrations were given before 103 persons. In place of a demonstration, a planting plan is sometimes prepared and given to the local people to follow. There were 95 such plans made.

In connection with a neighborhood improvement project, it is often possible to give specific advice to individual property owners. This work has involved 254 inspections, or farm visits, during the past year.

There were 21 days given over to exhibits at fairs, which also served to teach the general principles of landscaping.

In one county a prize essay contest was held in all the rural schools on the subject of "School and County Improvement Work." The response was almost unanimous, and the work turned in was of the highest grade. Some of the essays were illustrated with pictures of the school property before and after improvements had been made. The department has assisted with three planting field days, and requests for twenty more are on hand.

One new form of activity is the landscape improvement conference. At the call of the county agent, local leaders are gathered at a central point and interviewed by the department specialist. The field and scope of the work are outlined briefly, illustrations are shown of what other communities have done, and in an open discussion local opportunities, and ways and means of improving them, are considered pro and con. These gatherings being of an inspirational nature, the persons who have attended them have returned to their homes determined to use their influence toward making their community more livable and more satisfying. In addition to illustrated lectures, 71 conferences were held with 293 persons.

Many questions from individuals on miscellaneous problems of landscaping are answered by letter or printed matter. There were 72 personal letters written, and 11 news articles and 5 other articles were prepared and distributed.

Forestry

Greater progress has been made in extension in forestry during the past year than at any other period in the history of New York State. The part which Cornell has played in this growth is partly reflected in the recognition given to various members of the department staff through election to offices, and through advice sought by forest, lumber, and other organizations. Emphasis has been placed on reforestation, on matters pertaining to or growing out of the pine-blister-rust eradication work, and on the systematic development of forestry projects.

The Department of Forestry cooperated with the New York State Conservation Commission in the reforestation campaign which has been the dominant feature of the Commission's work in 1922-23, by taking an active part in the forest-planting demonstrations in 16 counties in the State. Altogether, 39 counties engaged in forest planting this spring. The number of demonstrations given in planting and in woodlot management was 78, with an attendance of 1127 persons.

The systematic fight against the white pine blister rust has led, during the past year, to the inauguration of an educational campaign to precede and pave the way for the eradication work. This ties in closely with the other forestry work done in cooperation with the farm bureaus. It has received no little attention from the extension specialist and his assistant during the past year. In all, there were 42 lectures delivered before 224 persons, on various educational subjects pertaining to forestry.

In addition to these special developments, the regular work in forestry extension has gone forward as in earlier seasons. Each year sees closer and more effective cooperation with the county agents, and an increased number of contacts with individual forest owners. The importance of

forestry on the farm is coming to be recognized clearly in New York State.

Among other of the more important forestry problems that are presented to the department for solution, specific mention may be made of the following:

1. Woodlot management — advising owners how to make improvement cuttings; how to market; how to combat disease; and, in general, how to bring the farm woodlot into greater productivity of better kinds of trees, and thus bring about more profitable and permanent usefulness.

2. Occasional estimating, as a demonstration for a neighborhood in regard to the real value of a stand of timber and how to make accurate estimates.

3. Conducting an informal marketing information service for the benefit of small producers of railroad ties, fence posts, firewood, and similar products.

4. Giving advice and instruction in creosoting fence posts and other exposed timbers.

5. Advising on the relative values of different species for various purposes.

6. Giving advice and assistance to producers of maple products, on management of the sugar bush, processing, and marketing. Much assistance has been given in recent years to the organization of a cooperative association for marketing maple products.

7. Giving miscellaneous advice on the identification of species and varieties, and the selection of varieties for plantings and for other purposes; advice to persons who have large investments depending on a permanent supply of timber, on how the permanency of that supply may be maintained; advice to municipalities and others on watershed plantings, city forests, and the like; and advice on many other matters pertaining directly or indirectly to forest trees.

There were 67 conferences and conventions held, with 797 persons present, 46 woodlot inspections were made, and 8 days were devoted to instruction in connection with exhibits at fairs. A total of 33 counties were reached in 154 days of field work. A partial measure of the office work done is indicated by 23 articles of 97½ pages, 7 circular letters sent to 809 persons, and 1423 personal letters.

Home Economics

The past year has seen better organization of all the already existing extension projects conducted by the School of Home Economics — nutrition, food preparation and preservation, clothing, household management, home hygiene and sanitation — and the introduction of one new project, house furnishing and decoration. Progress in the field has been marked by greater participation on the part of the local people in planning and carrying out projects.

The method of extending information by training local leaders has been further developed in the clothing, nutrition, and food-preservation projects, and plans have been made to try it next year in the household-management and house-furnishing-and-decoration projects.

Home demonstrations as a means of extension teaching have been used more widely this year than last. By a *home demonstration* is meant the demonstration of a good practice in her own home by a woman who follows the procedure recommended by a specialist, keeps records, makes reports, and in other ways gives publicity to the fact that she has found the practice to be good. Thus she demonstrates to herself and to the larger group or community the advantages of a practice which should be encouraged.

Present methods of extension will be further evaluated next year, and the organization of projects will be studied to determine whether the emphasis on appreciation, knowledge, and skill is distributed well and in accordance with the primary aims of extension service. Toward this end it is planned that a larger proportion of the specialists' time shall be given to supervision of the work of county and local leaders.

Nutrition

The nutrition service has aimed directly toward developing individual and community consciousness of nutrition needs, teaching certain facts that are bound up with improvement in conditions, increasing the supply of desirable foods by more adequate production and preservation and by introducing foods into local stores, and, finally, changing practices and attitudes to result in better future generations.

The Food Selection Demonstration I has been carried on, as during 1921-22, by the local-leader method. In seven of the eight counties and in the one city where it was undertaken last year, it has spread to new communities. Fifteen new counties have undertaken it for the first time this year. This demonstration consists of five discussions, on the relation of nutrition to health; scoring the family; meal planning; how to relieve overweight, underweight, and constipation; food values, and what and how much to plant in the garden and preserve for winter use.

The Food Selection Demonstration II has been undertaken by about two-thirds of the communities that had the elementary work the year before. Eight counties and one city have completed this demonstration this year by the local-leader method. The demonstration consists of four discussions, on digestion, indigestion, constipation and cathartics, and putrefaction.

In both these demonstrations many homemakers scored their families and followed special directions for relieving ailments, thus demonstrating to themselves and to their communities that certain desirable practices would bring about satisfactory results. A total of 269 communities cooperated in these two food-selection demonstrations.

Three nutrition-health demonstrations with school children were carried on, in three counties, by a specialist, local physicians, and nurses. The number of these demonstrations was greatly reduced this year because of lack of time of specialists and because adequate demonstrations had already been made in a number of counties. Efforts were concentrated on these three, and more frequent visits were made, and better cooperation was obtained from the physicians, than was the case the preceding year. The demonstrations consisted of a clinic at the beginning and at the end of the demonstration; semi-monthly visits by the specialist, to

teach and weigh the children, hold conferences with mothers, and supervise the work; and semi-monthly visits by a local nurse to teach and weigh the children. There were 47 children in the three nutrition-health demonstrations. Of these, 40 children changed 215 practices; only 2 children are known to have changed no practices; and the mothers of the remaining 5 were not at the final clinic and sent no report.

Of the 47 children, 42 showed improvement in health. Of the remaining 5, 4 exceeded the average gain in weight; 2 of these were not otherwise below normal. The 1 child who made no improvement changed no practices and attended the meetings very irregularly. Twenty-four children exceeded the expected rate of gain, and 9 others made the expected gain. Only 3 children failed to gain. They had been ill during the winter.

In connection with nutrition-health demonstrations, there were held 29 meetings attended by 520 persons, and 5 clinics attended by 114 persons.

The special nutrition service has been a new development this year. Any one wishing to receive directions for relieving overweight, underweight, constipation, or indigestion, or for the feeding and care of children, could make application for them, and if those applying submitted a record of their food and other health habits and physical condition, a special letter giving individual suggestions was sent. This was proved very helpful, and reports show that 94 per cent of the demonstrations tried were successful.

The study course on "Feeding the Family" has been continued, with minor changes. Since July 1, 1922, 146 new registrations have been received. Certificates have been awarded to 23 persons who have completed the course. Of the number who were on the active list at the beginning of the year, 61 per cent are still active.

Sixteen district rallies, 40 community meetings, and 3 annual meetings have been used to reach the local people. The total attendance at these meetings was 2318. Three talks were given to children, with an attendance of 310. Six teachers' conferences were attended, to encourage the teaching of nutrition in schools. The attendance was 424.

At advisory council meetings, special emphasis has been laid on the formulation of plans for the county programs of work. In nearly all counties where local-leader training was being conducted, time was given before the advisory council to talk over the needs of communities so that leaders could come to the council meetings with the recommendations of the local groups. This procedure has proved very valuable and will be carried on with greater care and thoroughness next year. Advisory council meetings have been attended in twenty-eight counties and one city in the past year. In each case the specialist met a group to discuss nutrition, and made recommendations to the council.

Some of the more significant additional statistics follow: number of leaders trained, 445; number of training meetings held, 238; number of meetings held by local leaders, 820, with an aggregate attendance of 10,140; number of practices changed, 16,209, reported by 5403 persons. More than 70 pages of new mimeographed material were prepared for use in the projects listed.

Food preparation and preservation

Food preparation. A subproject on food preparation has been developed in four counties this year. The work includes mastery of the fundamental principles involved in the preparation of milk, cheese, fruits, and vegetables, and stimulation of an increased use of these products through skill in their preparation and the development of better products. Meetings were held in four counties, with an attendance of 395. There were 12 local-leader schools held, 230 local leaders trained, 1356 women reached through local leaders, and 63 practices changed.

Food preservation. The subproject on food preservation on the local-leader basis was developed in six counties in 1922. It is now being carried on in seventeen counties and one city. The work includes the application of different methods for the successful canning of fruits, vegetables, meats, and their combinations, and the principles to be followed in the making of jellies, jams, conserves, and candied fruits and vegetables. The specialist held 83 training schools for leaders, at which the aggregate attendance was 698. These leaders then carried the message to 6684 others. Supervision of the work was carried on through the counties in cooperation with the home bureau managers. Local merchants cooperated in practically all of the counties, in procuring pressure canners and containers. There has been no difficulty in getting homemaking laboratories in the schools in the different counties, in which to hold the training schools.

Fair exhibits. The subproject on fair exhibits is being carried on in six counties. In each county definite plans have been developed in cooperation with the fair committee and the home bureau. In revising the premium list it has been possible, by elimination of undesirable articles, to increase the premiums as well as give place for worth-while exhibits, and special effort has been made to standardize and classify these exhibits. There were six counties visited; 6 community meetings held for the discussion of the subproject, with an attendance of 687; 10 demonstrations given, with an attendance of 1300; 4 conferences held with fair committees; 5 premium lists revised; 5 judging demonstrations given; and 5 conferences held regarding space and shelving for exhibits.

Milk campaigns. Because other phases of the project received relatively more attention, only three counties held milk campaigns this year. Milk utilization has been a part of the work in food preparation. One lesson on the preparation of milk dishes was given in each of the four counties taking food preparation, and milk was used freely in the other three lessons.

Office work. Office work has consisted mainly in the preparation of material for local-leader schools, lesson plans, procedure sheets, individual reports, and exhibits for summary meetings. Some experimental work has been done on fruit and flour.

Clothing

Extension work in the clothing project has been developed in thirty-one counties and one city. The local-leader method has been used almost exclusively except in one county.

For effective administration the State was divided into nine districts.

with a demonstration center in each. Work in each of the cooperating counties was in charge of a county leader (13 home demonstration agents or assistants, 18 paid leaders) under the direction of the specialists.

The aims of the extension work in clothing are: (1) to teach as far as possible all women interested in solving their clothing problems more easily, effectively, and satisfactorily; (2) to disseminate sound information relative to the selection, construction, and care of clothing, to the end that standards in each of these phases will be raised and women and children will be more suitably, becomingly, and healthfully dressed, and that time, money, and energy expended on clothing will be more wisely spent; and (3) to train women to become increasingly independent in the selection of their clothing, and to establish community enterprises which will further the aims of the project.

Looking toward the accomplishment of these aims, emphasis this year has been placed on the review and the wider dissemination of information on projects previously developed, as (1) skirt design and construction, (2) dress-form construction, (3) preparation of the dress form for use, and (4) use of the dress form, including work on the choice and alteration of patterns, together with the application of the fundamental principles considered in the making of perfectly fitting patterns, and garments of attractive type. New projects have been developed on (1) the choice and combination of colors, (2) pattern making, (3) pattern adaptation, (4) costume design, (5) garment fitting, and (6) correct methods of construction.

Information essential to wise choice and use of materials, colors, and patterns, and fitting and finishing processes, was given. Opportunity was offered for laboratory work on garments embodying typical problems related to the subject matter under discussion. The work was so organized that cooperation in it was equally as valuable and attractive to women who buy their clothing or hire it made, as to those who make their own clothing.

Statistical summary. Specialists have held 162 training meetings for local leaders and 132 for county leaders, with a total attendance of 2764; have given 12 special lecture demonstrations and conducted 20 county-wide rallies supplementing work with local leaders, with an attendance of 1000; have observed the work of county and local leaders at 21 meetings; and have met clothing leaders in conference at advisory council meetings in 23 counties, and at annual meetings in 2 counties. Discussion of the projects at these meetings supplementing the conference with leaders has reached 2328. Special conferences to the number of 98 have been held in the field with executive board members, agents, and county and local leaders, through which 294 persons have been reached and have contributed suggestions on the projects. Total contacts by specialists have been 6286.

At the time of preparation of this report, complete returns on the year's work are not available from all counties. Reports on hand indicate that 688 communities have cooperated on all of the 1922-23 projects. Many of these have cooperated also on one or more of the projects previously developed in the State.

County leaders have held 555 training meetings with an attendance of 4591, and 513 conferences with 1206 persons. Local leaders have held 1606 meetings with an attendance of 19,189, and 1749 conferences with 3657 persons. This makes a total of 4423 meetings and conferences held by county and local leaders, with 28,643 persons reached.

Of the 31 counties cooperating, 20 have submitted reports. Of these only 16 have reported changes in practices. These incomplete county reports indicate that 2773 women have cooperated on the project this year, and that 2796 practices have been changed.

Household management

Effort has been largely directed in carrying farther and to more counties the work in household management that was started last spring, namely, helping women to help themselves, to have more convenient kitchens in order to save energy, time, and money for other purposes. Home demonstrations are used for this purpose, in connection with one or two visits of the specialists, where possible, to the community, the district, or the county.

The specialist has been in 31 counties and in 2 of the organized cities during the past year. Through the meetings held, 3500 people have been reached directly.

Home demonstrations. There are about 300 enrollments in the project on "The Convenient Kitchen," each enrollment standing for an individual woman or a group of from twenty-five to thirty who are cooperating. As these are home demonstrations and the women take their time about completing them, figures are not yet available as to the number of practices changed. Only a very few have yet finished the fifth and last demonstration in this project, but a check is made as the work progresses and is finished. It is very definitely known that women are making such changes as the following: moving refrigerators to more convenient places; getting a better concentration of small equipment; training themselves to work more easily; changing working heights; covering working surfaces with inlaid linoleum; buying or making real service wagons; discontinuing the use of harsh abrasives that have been injuring the smooth surfaces of enamel sinks, bowls, and tubs; buying new equipment more intelligently. In one community where ice had not before been available, organized effort on the part of the group brought about the provision of an ice supply. Pedometers are being bought and worn — a practice which may prove effective in helping the women to watch themselves, make changes, and spread the influence to others who are more difficult to reach and convince.

Local leadership. Nineteen communities in one county are carrying on the work on the local-leadership basis. The women are most enthusiastic and are getting real results. Complete records of changes of practice are being kept, so that as the work closes a very definite report can be made.

Home hygiene and sanitation

The extension work in home hygiene and sanitation was aimed at three main objectives — sanitary homes, personal hygiene, and prevention of common colds.

The project on sanitary homes was developed in two ways; (1) by means of scoring on the basis of minimum essentials of sanitary housing, full directions being furnished the housewife for a home demonstration; this demonstration was adopted in 7 homes; (2) by means of home and community demonstration in fly eradication; some 325 homes adopted this demonstration.

The importance of personal hygiene was shown by means of home projects and demonstrations. Directions as to care of the feet, the skin, the hair, the teeth, and the nails, were adopted in 57 homes.

The instructions furnished for a home project and demonstration on prevention of common colds were adopted in 99 homes.

Each of the foregoing objectives, and other miscellaneous health measures, were furthered by the following means: lectures, of which 26 were given with an aggregate attendance of 1269; health programs for study clubs; mimeographed articles and news stories, of which about 36 pages were prepared; and conferences with home demonstration agents and committees.

House furnishing and decoration

From October 1, 1922, to June 1, 1923, the extension specialist in house furnishing and decoration worked in 19 counties, holding 93 meetings with a total attendance of 2960. These meetings were attended by members of home bureau units and women's clubs, high-school girls, normal-school students, and members of Pomona Grange. The work done at the meetings consisted of a lecture supplemented by illustrative materials. By means of blackboard illustrations, principles of good arrangement of furniture in a room were taught, and with the aid of color charts and samples of materials the theory of color and its application to various rooms in the house was explained. Principles of elimination and simplicity were especially dwelt upon, and every effort for simplification was made.

Aside from the work done at the places where these meetings were held, many homes, some home bureau offices, and a few churches and libraries, were offered for use as examples for suggestions on furnishing and arrangement.

Letters asking for advice about various problems of refurnishing and decoration have been given careful attention and answered by the specialist. There have been 180 personal letters written.

Home economics publications and information service

Home economics extension work has been carried on largely through bulletins, stories for the state press, articles for agricultural papers, publicity in connection with other lines of home economics extension activity, a special service of subject matter and news for the home bureaus, the assembling of information and answering of correspondence on general questions related to homemaking problems, and some preliminary training in publicity for county leaders. General direction is given also to the distribution of reading-course bulletins for the home, and to editing all mimeographed and printed material and the reading of mimeograph stencils used in connection with home economics extension

work. Supervision is given to all departmental mailing in connection with projects or in answer to general requests. This has been centralized in one office, in order to relieve stenographic help in other offices and to establish a less confusing and more nearly accurate system of mailing that may be checked for errors. Answering all correspondence requesting special information is also a part of the work of this office.

The limiting of enrollment for reading-course announcements of new bulletins to persons directly requesting enrollment has kept the reading-course list within bounds. Until last year all persons requesting bulletins or other information had been enrolled. The mailing list was revised last year and now includes 5150 names. Individual requests for home bulletins have averaged over 500 a month throughout the year, and an average of over 110 letters of information have been written monthly.

Due to the rapid growth of field work under the local-leader plan, the specialists have not had time to prepare their material for printing and it has been necessary to keep most of the project material in mimeographed form again this year. This has resulted in an excessive amount of mimeographing. Plans already made for next year include emphasis on the preparation of extension material for publication in printed form available for general distribution.

Monthly contributions to the press service of the College, the *Extension Service News*, and the Farm and Home Bureau News in different counties, and incidental contributions to a few farm and grange papers and the *State Home Economics Messenger*, have been made. One issue of the "Touch Box" and three issues of the "Home Economics Reminder" have been prepared and sent out during the year.

Need for a closer touch with county publicity in home bureau work has been met by a few training meetings for publicity leaders and the preparation of preliminary material for the use of these leaders.

Plant Breeding

The extension activities of the Department of Plant Breeding are directed toward securing the widest possible use of improved strains of economic field crops as recommended by the experimental staff of the department. A very large proportion of the seed of corn, oats, barley, and rye used in New York is imported from other States without regard to its varietal adaptability. New York grows annually more than one million acres of oats, and probably from one-third to one-half of this acreage is sown to material brought in for feeding purposes.

The experimental work of the staff at Ithaca is supplemented by regional tests in which the adaptation of strains or varieties is determined for the various areas of the State. While experimental in character and designed to supply information, these tests have been used for demonstration purposes and have had a local or regional value in stimulating the use of recommended varieties and strains. The results obtained have been of material assistance to county agents, in making recommendations and for use in extension meetings and publications. A summary of this work is as follows: days planting plats, 48; days harvesting plats and obtaining data, 64.

Establishment of seed sources. Most of the strains of oats, barley, corn, and wheat recommended have been produced at the Ithaca station. The procuring of adequate supplies of seed is necessarily a slow process, since it waits upon the preliminary procedure of thorough testing. As rapidly as the seed can be multiplied at the station, it is put into the hands of careful growers in lots of one bushel or more. In the fall of 1922 there were distributed from the college farm 200 bushels of Honor wheat and 10 bushels of Forward wheat. A large amount of oats and barley had already been distributed during the spring of 1922.

The establishment of seed sources must be checked by personal visits and field inspections. During the year 246 field inspections were made. This resulted in the listing of some 136 local seed sources of oats, corn, barley, wheat, and rye. Practically all the approved seed listed was sold to growers. An illustration of the progress made in introducing Cornellian oats in one county is cited. In 1922 one of the regional experimental plats and three variety demonstrations were conducted in that county. Effort was made to interest growers in the matter, and, as a result, about 1500 acres of Cornellian oats were sown this year (1923).

A questionnaire was sent to county agents asking for information relative to the use of improved seed locally. Replies were received from 28 counties, giving the following data: number of growers using recommended seed, 4170; number of bushels sown in 1923 (oats, wheat, barley, rye, corn), 39,990.

The giving of publicity as to the results of these demonstrations, and instruction in the matter of seed selection and seed growing, were accomplished by the following means: 22 lectures, attended by 847 persons; 36 demonstration meetings, attended by 393 persons; exhibits at fairs and seed shows, in which 28 days were expended; 240 farm visits; 10 conferences; and 2 days spent in judging seed shows.

All phases of the seed situation are covered in the office correspondence. When possible a circular is used, but generally specific information is desired and an individual letter is sent. There were 1388 personal letters written in the past year, and 17 circular letters sent to 1543 persons. In addition, 18 articles were written for the press.

Pomology

The types of extension service rendered by the Department of Pomology in the past year have consisted in teaching, demonstrating, advising, and giving general information as to the following matters: (1) the best varieties of trees, vines, and small fruits to set in different localities on various soils and under special conditions; (2) how to train and take care of young trees and plants; (3) principles and practices of pruning both young and mature trees; (4) principles and practices of cultural management of all kinds of fruit plantations; (5) fertilization needs and practices; (6) how and when to thin fruit, and the influence of thinning on quality; (7) picking and handling fruit in relation to maintaining its quality to the market; (8) packages and packing for various market needs; (9) cold-storage conditions; (10) adaptation of particular farms, localities, and regions, to conditions and market needs; (11) value and uses of different varieties of fruit; (12) bridge- and top-grafting practices.

During the year emphasis has been directed primarily to improving the quality of fruit. For example, in pruning, special stress has been placed upon more pruning of a renewal type for old trees as an important step in the production of better fruit. In grafting, an effort has been made to have the odd varieties of little commercial importance top-worked to good commercial sorts. The importance of thinning in improving the quality of the fruit, the elimination of cull fruit, and the improvement generally in the grade of fruit, have also been stressed.

There are now 43 long-term demonstrations located in 11 counties, in which some very striking results have been obtained. In a ten-years-old Ben Davis orchard in Wayne County, trees pruned according to the local method produced an average of four bushels, while those pruned according to the college method yielded just twice as much. A flood of calls for bridge-grafting demonstrations came as a result of unusual injury from mice and rabbits during the winter. This work must be done within a relatively short period and it was impossible to respond to all the calls, but considerable publicity was given to the work in order to augment the effect of the personal demonstrations.

Work was done in 37 counties, making 5989 contacts at lectures, demonstrations, conferences, and farm visits. In addition there were 1201 personal letters written, and 3 circular letters sent to 102 persons. There were also 22 articles written, totaling 85 pages.

Poultry Husbandry

The aim and purpose of extension work in the Department of Poultry Husbandry is to increase efficiency in the production and marketing of poultry products. This involves attention to all phases of the business. Contact is made with both small and large producers. During the year chief emphasis was placed on breeding as expressed through the work in culling and certification, on management as reflected in feeding and disease control, and on marketing eggs as influenced by grading and packing.

Culling of flocks is handled chiefly in two ways: (1) By demonstrations in which interested persons are taught how to recognize the good and the poor producers by means of physical examination. There were 350 such demonstrations held in 38 counties, with 7149 persons in attendance. (2) By the cooperative employment of men recommended by the College, by flock owners who want an expert to cull their birds. The College trains and schedules the men. The entire cost of this service is paid for by the persons who use it. Last summer these paid expert cullers worked in 20 counties and handled 127,912 birds in 682 flocks, from which 26 per cent of the birds were eliminated as low producers.

Certification of poultry continues to increase in growth as an educational demonstration. Each year there have been certified an increasing number of fowls for breeding purposes. Last year the number of birds certified was 30,305, in 46 counties on 252 farms. Responsibility for certification is now wholly carried by a cooperative association of poultrymen, which also pays the full costs of examination, banding, and necessary records.

The plea for better breeding is further handled by means of extension schools, lectures, bulletins, judging of poultry shows, and distribution of pedigreed cockerels and day-old chicks. A measure of the amount of attention given to this subject is indicated by the following figures: number of baby chicks sold, 2400; number of days judging at fairs and poultry shows, 32. Also, there was held at the College in December the First New York State Production Poultry and Egg Show. The response by the poultrymen was beyond expectation. Over 700 birds were entered by 83 exhibitors. Illustrated lectures on breeding, and demonstrations on judging, were an important part of this event.

Extension work in feeding is now handled chiefly by means of a printed ration service, personal correspondence, farm visits, and lectures and practice at schools and other meetings.

In diseases and sanitation, 7 meetings were held with 158 persons present.

The marketing problem was approached chiefly through demonstrations and practice in grading and packing eggs, of which 20 were held, with an attendance of 784.

In addition to these major phases, more or less attention was given to other problems, including poultry-house construction, artificial illumination as a means of controlling production, and poultry-farm management, particularly cost-account records.

The resident poultry extension specialist farm management project now includes two regions. Each of these two regions has the continuous service of a resident representative of the College, who visits each of the cooperators (from 40 to 50 in number) from six to eight times a year. The flock owners receiving the service pay most of the costs.

Progress and growth is shown in those projects which require the cooperators' own personal time and effort. Each year an increasing number of persons are applying for and keeping accurately cost-account records recommended by and under the supervision of the College. These records supply much valuable data on cost of production. Also the number of persons enrolled in the reading courses is constantly increasing. There are now 152 persons enrolled in the Farm Study Course in poultry, and 99 in the Advanced Reading Series.

Measures of activity not included in the foregoing statements as credited to any special phase of poultry keeping include 479 lectures, with an attendance of 18,152; 1184 farm visits for individual advice on special problems; 87 conferences with county agents and other local leaders; and 5 poultry tours attended by 345 persons.

Rural Education

In addition to the junior extension work supervised in the Department of Rural Education and noted elsewhere in this report, considerable service is rendered to the rural schools of the State. The most important phase of the service is the preparation and distribution of the Rural School Leaflet. During the past year four numbers of this publication have been issued. The distribution has been as follows: teachers' issue, 20,000; children's numbers: November, 120,000; January, 100,000;

March, 109,000. It has been impossible to meet the calls for this Leaflet, especially from outside the State.

The demands for addresses at teachers' conferences and at meetings of school patrons continued to be greater than the resources of the department would permit it to meet. It was possible during the year to give 15 addresses, with an aggregate attendance of 2670.

Rural Engineering

Extension work in the Department of Rural Engineering has to do with the selection, care, and operation of farm and household machinery, including the installation of land drainage systems. The most important single enterprise is the demonstration, on selected farms in many communities, of how to drain both large and small areas under varying conditions. The wet areas are surveyed, levels are indicated, and advice is given on the size of ditch or tile needed, distances between mains and laterals, construction of outlets, costs, and many other details. During the year drainage demonstrations were laid out which involved a total of 32,201 rods, affecting 5599 acres. One of these was an outlet ditch over 8 miles long draining 1200 acres owned by 55 farmers.

The care and operation of gasoline engines, including tractors and automobiles, was taught mainly by means of four- or five-day schools in which lectures, demonstrations, and practice periods for the students made up the programs of intensive practical courses. During the past winter 13 such schools were held.

Similar schools are held in farm shop work, in which students are given practical instruction in harness repairing, tool sharpening, saw filing, soldering, belt lacing, rope splicing, and other matters. Of the shop schools, 6 were held. Attendance at these schools averaged about 23 students.

Water supply and sewage disposal have continued to receive considerable attention. Lectures and demonstrations profusely illustrated by lantern slides, drawings, charts, motion pictures, actual plumbing materials, bulletins, and circulars, have been given. The aims are to show methods of bringing water into house or barn, storage and pressure systems, and the like, and to show how to dispose of waste. Special emphasis is placed on making a beginning so planned and designed that additional equipment may be added from time to time without discarding elementary installations. One series of meetings was held by means of a truck which carried a complete equipment capable of being quickly set up for a demonstration of how to install running water and a drainage system in the home. The tour included 55 days and 77 demonstrations, there being two demonstrations a day on nearly two-thirds of the days. The total travel was 2500 miles, and the total attendance was 2636 persons.

A trip of nearly two weeks duration was made just before haying time, in which meetings, often three a day, were held in barns or halls to demonstrate how to splice a hay rope and how to tie a bowline knot. There were 17 of these meetings held, with an attendance of 214 persons.

A third trip, aggregating 7 working days, was devoted to barn-ventilation meetings, demonstrating with a working model the usual method

of barn ventilation. At 15 meetings there was a total attendance of 155 persons who were uniformly interested. At the end of each demonstration a careful study was made of the barn at which the demonstration was held, and a ventilation system suitable for that particular case was designed and explained.

Sewing-machine schools for women have proved highly successful. At these meetings the principles underlying the operation of the machines are explained, and the provisions for adjustment and the proper method of thoroughly cleaning are discussed. When the schools are of two days duration, those in attendance are requested to bring in their own machines on the second day for overhauling. Nine of these schools were held, with a total attendance of 251 persons.

More or less instruction and advice were given by means of lectures, farm visits, letters, plans, and otherwise, in reference to the development of small water-power plants, construction of various farm buildings, the use of concrete, blowing out stumps or making ditches by means of dynamite, installation of radio, adjustments of binders, tractors, and other farm machinery, and numerous other mechanical and engineering problems with which farmers are confronted. There were 20 such lectures given with a total attendance of 663 persons.

At the State Fair at Syracuse there was erected for the second consecutive year a large overshot water-wheel arranged to generate electricity and to illustrate in a practical way the possibilities of power from small streams. This year an additional feature was provided, in the form of a modern kitchen equipped with recent designs of various electrically driven conveniences supplied by power from the generator of the water-wheel installation.

Rural Social Organization

The extension work of the Department of Rural Social Organization thus far has had to do chiefly with recreation. County-wide meetings for rural recreation leaders, under the auspices of the county home bureaus, were held in ten counties of the State. These have proved a valuable means for training rural leadership in this field. During the year 26 training meetings were held, with 605 teaching contacts.

Lectures and lecture demonstrations were given on community singing, games, contests, and the like, on community buildings, and on various aspects of rural social life. Members of the department delivered 111 lectures to audiences aggregating 10,028, and engaged in 12 field conferences with 144 persons.

Training schools in rural dramatics were conducted, in which persons representing several communities in a county were given instruction and practice in the selection and presenting of a play. Ten counties received help in holding 58 such training schools, in which 804 teaching contracts were made.

Considerable service was rendered by means of correspondence advising grange lecturers and officers of other organizations on planning programs, selection of libraries, construction of community houses, consolidation of churches, and numerous other social problems. Bulletins, mimeo-

graphed lists of recommended plays, and other such material, were also used in answering inquiries.

There were 2567 personal letters written, 14 circular letters sent to 2506 persons, 4 articles totaling 12 pages written, 23 circulars and pamphlets sent out, and sets of plays loaned to 395 borrowers.

Vegetable Gardening

The extension activities of the Department of Vegetable Gardening fall into three classes, having to do, respectively, with (1) commercial vegetable growing, (2) home gardening, and (3) junior project and school gardening.

Commercial vegetable growing. During the past year chief attention has been given to the question of better grading and standardization of vegetable crops in New York State. Field meetings, lectures, and press articles have been used to point out the advantages of grading and standardization as a basis of better marketing. Much of this work has been carried on cooperatively with the state and federal marketing agencies, and the use of the federal grades has been encouraged, especially with potatoes, lettuce, and celery. Mainly on this subject, 104 lectures were given with an attendance of 3281 persons.

By means of surveys and otherwise, it has been found that potato growers generally do not use as much seed to the acre as would seem justifiable. With the price of seed potatoes fairly low this year, an effort has been made to increase the rate of planting. Experimental results indicate that the average of 11 to 12 bushels to the acre might economically be raised to 17 or 18 bushels, with a corresponding increase in yield. Several counties are conducting field demonstrations along this line, as well as promoting the use of more seed through press articles and lectures. In one county such demonstrations showed net increases in yield of from 30 to 40 bushels an acre by increasing the rate of planting from 11 to 22 bushels an acre.

During the year the following principal demonstrations were conducted in cooperation with the county agents: (1) fertilizer demonstrations on cabbage, potatoes, tomatoes, and lettuce, on muck soil; (2) cover-crop demonstrations for upland soil on Long Island and on muck soil in Wayne County; (3) strain and variety demonstrations on late cauliflower, early and late cabbage, lettuce, cucumbers, field beans, and potatoes; (4) potato seed-size pieces, and rate of planting; (5) plant-growing demonstrations with tomatoes.

Up to June 30, 1923, about 135 demonstrations have been started in 42 counties. Demonstration meetings on the site of these demonstrations for the purpose of pointing out results were held to the number of 8, attended by 550 persons. There were involved also 33 method demonstrations with 541 persons in attendance; 2 training meetings with 43 in attendance; 241 inspections and farm visits; and 87 conferences with 544 in attendance. Thirty-eight articles, 21 circular letters sent to 12,951 persons, and 2893 other letters, were written.

Home gardening. Two series of home-garden photographs have been selected and are being reproduced as lantern slides. Accompanying

lecture notes for use with these slides are available for county agents and others interested.

The home-garden articles for the press have been continued this year, and their effectiveness has been increased by an arrangement whereby some of them are available to newspapers in plate form. More than eight articles have been sent out during the year.

The department has continued the cooperation begun last year with nutrition specialists of the School of Home Economics. In this work, the groups of home-bureau local leaders who have been studying nutrition problems during the winter, receive at a spring meeting suggestions and information in the planning of a garden and the production of the vegetables recommended by the nutrition specialists. A budget showing approximately the amount of vegetables needed for one person for one year, and an estimate of the average number of feet of row required to produce the given quantity of each vegetable, is presented and explained to these groups of local nutrition leaders. Nine such groups were met during the year, in seven counties.

A new home-garden bulletin is ready for the press. It is intended to replace separate bulletins now in circulation, and gives more attention to the value of vegetables in the diet than is usual in such publications.

Extension work with boys and girls. The extension specialist has given instruction and assistance to county club agents, school teachers, and other local leaders in connection with the junior potato, bean, corn, and garden projects. Conferences are held with leaders, and lectures and demonstrations are given before the boys and girls enrolled in the work.

A new junior garden bulletin has been issued, in which the material has been so divided as to fall naturally into a series of exercises, or lessons. Suggestions for presenting the exercises to girls and boys are given in the back of the bulletin.

The corn project emphasizes seed testing, seed selection, and the improvement of the stock from year to year. A revision of the junior corn bulletin is ready for the press. Like the new junior garden bulletin, this contains exercises, or lessons, for the use of local leaders.

The bean project is especially concerned with disease-resistant varieties and the selection of seed from healthy plants.

The potato project has been successful in increasing the use of inspected seed and extending the practice of seed treatment, and to some extent also in getting the girls and boys to spray or dust.

The garden project encourages especially the planting of the vegetables that are most valuable in the diet, such as tomatoes, leaf crops, and so forth.

Carrying out these enterprises has involved: 8 method demonstrations, attended by 634 persons; 18 farm visits; 35 conferences, attended by 296 persons; 105 lectures, attended by 10,902 persons. Twenty-five articles, 8 circular letters sent to 160 persons, and 307 other letters, were written during the year.

Correspondence courses. The correspondence courses are becoming more popular each year. The department now offers two farm study courses, one in general vegetable gardening and a new course in vegetable forcing. The latter course was first offered in March, 1923, and now

has an enrollment of 9 persons. During the year 137 papers were graded in the first course, and 24 in vegetable forcing. On June 1 there were 19 registered for the gardening course and 9 for the forcing course.

Besides the above-mentioned farm study courses, a course in home gardening is being continued. The registration for this course varies from month to month. During the winter as high as 125 persons sent back answers to the questions each month. On June 1 there were 73 persons enrolled for this course.

Miscellaneous. In addition to the large number of gardening bulletins distributed on requests going direct to the mailing room, special information is supplied to commercial gardeners and amateurs who apply for it concerning seed sources, varieties, and strains best adapted for specified conditions, and also advice on cultural methods, fertilizing, and harvesting, storing, and marketing vegetable crops. The judging of vegetables at fairs and seed shows, and the furnishing of plans and specifications and other advice on the construction and operation of coldframes, hotbeds, and greenhouses, also demand and receive attention.

Weather Bureau

The extension work of the Weather Bureau has been concerned mainly with three projects: (1) spray-service forecasts in the interest of fruit growers; (2) harvest-weather forecasts in the interest of the general farmer during the harvest season; and (3) cooperation with the New York State Conservation Commission in its experimental work for the control of the spread of the gypsy moth in this State.

The spray-service forecasts were telegraphed daily from April 1 to June 30, 1923, at about 10:30 p.m., from the local Weather Bureau office to the county agents for the following counties: Chautauqua, Niagara, Genesee, Monroe, Wayne, Ontario, Yates, Onondaga, Oswego, Dutchess, and Ulster. These special forecasts do not go direct to the growers, but constitute essential data used by the county agents and the special assistants in timing their advices to the growers on spraying operations. (Detailed information is given in the Entomology and Plant Pathology reports on spray service, page 74 of this report.) By way of illustration, the rainy period on May 20 and 21 was very favorable for scab infection. Warning of this period was sent out on Wednesday night, May 16, and was emphasized on Thursday, so that growers had from two to three full days in which to apply the spray before the rain, a practice essential to good protection against scab.

Last season, from June 15 to August 31, 1922, the harvest-weather forecast service was in operation in twelve counties, all of which asked for its resumption this year. Other counties also requested the service, and it has been possible during the current season, through the cooperation of the United States Weather Bureau and the College, to supply the forecasts to twenty-one counties. It is estimated that at least 12,000 farmers received this service and were guided in their harvesting operations thereby.

The radiophone is being tried for the first time this season as a means for distributing the harvest-weather forecasts. The General Electric Company, of Schenectady, broadcasts the forecasts daily except Sunday, at about 12 o'clock noon.

Recommendations

An outstanding need in extension education at the present time is that emphasis should be placed upon the economic problems of agriculture, and that our teaching effort should be directed to helping farmers to a better understanding of economic principles and of the situations and conditions which are causing farmers' difficulties at the present time, together with possible ways in which these difficulties can, in part at least, be met. This should include instruction in the principles and practices of good farm organization and balance, with particular reference to readjustment of individual farms so as to avoid as far as possible those enterprises on which return is inadequate and most likely to continue so, emphasizing those farm enterprises which are now most profitable and give the greatest promise of continuing to be profitable. It should include also the larger economic problems of marketing and distribution, with particular reference to methods and costs.

Ideally, our extension forces should be mobile enough so that persons could be withdrawn from the production phases of extension teaching and added to the staff dealing with economic problems. Under our present organization and conditions, this is impracticable. The best way to meet this need, therefore, seems to be to ask such of our extension workers in production as can well do so, as opportunity offers, to direct as much of their teaching as possible toward the solution of economic problems, together with the addition of a small force of special winter institute workers who have had economic training and who are specially well qualified to teach in this field. Plans are being made to these ends.

Another important need of the extension service is a better distribution of the time and effort of extension specialists throughout the season, with less concentration on the single method of lectures at winter meetings which is now chiefly used in the short period of two or three months. A special committee of county agents and extension specialists has been considering this problem, and has made a number of detailed recommendations intended to accomplish this result, at least in part. These include the further development of local leadership, the wider use of the printed word, emphasis on field and barn demonstrations and tours in the summer, greater use of conference and other methods, and many detailed adjustments which will contribute to this end.

In general, there is need for better team work on the part of all extension workers. Departmental lines need to be softened and greater correlation secured, particularly between closely related lines of work, as has been done during the past year in the case of the lime-legume-livestock campaign, which embraced the Departments of Agronomy, Animal Husbandry, and Agricultural Economics and Farm Management. There is need also for closer correlation between the county agent administrative or supervisory forces and the specialists, so that there may be a common objective in arranging and carrying out the most applicable and effective programs in particular counties, with proper balance in relation to needs and problems. Steps are being taken to accomplish both these ends, and we believe that some progress has already been made.

As recommended in more detail elsewhere in this report, an effort should be made to increase the scale of salaries of all county agents who

have shown their ability to handle county problems with satisfaction, as one means of establishing greater stability in the county programs and personnel and of securing more continuous service of agents.

The time has come when our extension publications need to be studied more carefully as to their organization and the method of presentation of teaching material. We shall do well to consider presenting our subjects from the job-analysis standpoint, eliminating as much as possible the theoretical discussion, and proceeding to give the reader directly the exact information which he needs to deal with the problem at hand, and then leading him from the specific problem which interests him at the time into the broader field of principles and reasons why. Our publications may also need reshaping from the standpoint of utilizing them more fully for the training of local leadership. The extension field is too large for specialists and county agents to hope ever to reach personally all the farmers of the State. At best the majority of farmers can be reached only indirectly. The local-leadership method promises much in this direction, but leaders must be developed in training schools and they must be given specific information through publications.

The recommendation of several previous years, that early steps be taken to provide contiguous offices for the administrative staff in extension, is renewed. It is one of the most urgent needs of the extension service that persons engaged in its supervisory and administrative phase have their offices close together, so that frequent conference is easy and better correlation may be secured.

FINANCIAL SUMMARY

A complete financial statement of all funds from all sources used by the State College of Agriculture appears in the annual report of the Comptroller of Cornell University, printed separately. Copies may be obtained on application to the Comptroller. A summary of receipts and expenditures is here appended.

FINANCIAL STATEMENT, 1922-23

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1922	Receipts (college and Smith-Hughes) 1922-23	Expenditures 1922-23	Balance	
						Lapsed	Unexpended June 30, 1923
State							
1920-21 Indian Extension.....	\$ 10,000.00	\$ 9,715.97	\$ 284.03	.....	\$ 272.47	\$ 11.56	.....
1921-22 Maintenance.....	1,204,860.00	1,164,915.91	39,944.09	.....	18,185.37	21,758.72	.....
1921-22 Deficiency (for printing reports and bulletins).....	15,000.00	3,257.00	11,743.00	.....	11,743.00	.....	.....
1922-23 Maintenance.....	1,222,675.00	.....	1,222,675.00	.....	1,158,660.25	.....	\$ 64,014.75
1922 Equipment of Dairy Industry Building.....	183,000.00	.....	183,000.00	.....	40,992.76	.....	142,007.24
1922 Equipment of Cold Storage Building.....	15,000.00	.....	15,000.00	.....	12,494.42	.....	2,505.58
1922 Long Island — Soil and Fertility, and Vegetable Production.....	11,800.00	.....	11,800.00	.....	9,273.50	.....	2,526.50
1922-23 Deficiency (for fuel, light, power, and water).....	27,000.00	.....	27,000.00	.....	19,997.08	.....	7,002.92
1923 Contingent.....	10,023.39	.....	10,023.39	.....	10,023.39	.....	.....
Total.....	\$2,699,358.39	\$1,177,888.88	\$1,521,469.51	.....	\$1,281,642.24	\$21,770.28	\$218,056.99
Federal							
Morrill and Nelson.....	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch and Adams.....	27,000.00	.....	27,000.00	.....	27,000.00	.....	.....
Smith-Lever.....	198,634.11	.....	198,634.11	.....	197,704.93	\$929.18	.....
Smith-Hughes.....	.....	.....	*(7,031.80)	\$32,270.13	30,034.42	.....	*( \$4,796.09)
Total.....	\$245,634.11	.....	\$238,602.31	\$32,270.13	\$274,730.35	\$929.18	*(\$4,796.09)
College							
Tuition and fees	.....	.....	.....	{ \$ 69,889.16	.....	.....	\$91,701.69
Sales and services	.....	.....	\$79,342.73	{ 306,527.61	\$374,081.20	.....	.....
Contingent	.....	.....	.....	10,023.39	.....	.....	.....
Total.....	.....	.....	\$79,342.73	\$386,440.16	\$374,081.20	.....	\$91,701.69
Grand total.....	.....	.....	\$1,839,414.55	\$418,710.29	\$1,930,462.79	\$22,699.46	\$304,962.59

* Overdraft on Smith-Hughes Fund covered by subsequent remittance from State Department of Education.

CONCLUSION

The State College of Agriculture is mindful of the deep interest and active support of its work given by the President, the Board of Trustees, and other administrative officers of Cornell University, and by the chief Executive of the State, the members of the Legislature, and the state fiscal officers with whom the College has dealings. I desire to acknowledge, also, the helpful assistance given in the preparation of this report by the Vice Director of Extension, M. C. Burritt, the Vice Director of Research, Dr. W. H. Chandler, and the Vice Dean of Resident Instruction, Dr. Cornelius Betten.

Respectfully submitted,

A. R. MANN,
*Dean and Director, New York State College of
Agriculture and Cornell University Agricultural
Experiment Station.*

INDEX

A	PAGE
Agricultural Chemistry, extension work.....	65
Agricultural Chemistry, research.....	33
Agricultural Chemistry, transfer to College of Arts and Science.....	24
Agricultural Economics and Farm Management, departmental notes.....	25
Agricultural Economics and Farm Management, extension work.....	66
Agricultural Economics and Farm Management, research.....	33
Agronomy, extension work	70
Agronomy, research.....	34
Animal Husbandry, departmental notes.....	25
Animal Husbandry, extension work.....	71
Animal Husbandry, research.....	36
Appropriations of Legislature of 1923.....	15
Arts and Sciences, College of, association with Department of Botany....	26
Automobile accident, settlement of claims.....	17
 B	
Babcock, H. E.....	20
Bean production, research in.....	30
Beekeeping, extension work in.....	73
Biology, summer instruction in.....	22
Botany, acquisition of Durand herbarium and library.....	24
Botany, association with College of Arts and Sciences.....	26
Botany, departmental notes.....	25
Botany, extension work.....	74
Botany, research.....	37
Brim, O. G., resignation.....	21
Building acquisitions.....	18
Building program	17
 C	
Cavanaugh, G. W.....	25
Chandler, W. H., resignation.....	20, 28
County agent changes.....	52
County agents, salaries of.....	52
County fair exhibits.....	49
Cut exchange	58
 D	
Dairy Industry, departmental notes.....	26
Dairy Industry, extension work.....	78
Dairy Industry, new building.....	18
Dairy Industry, research.....	38
Dean's report	13
Departmental notes	24
Durand herbarium and library.....	24
 E	
Enrollment of students.....	23
Entomology, departmental notes.....	26
Entomology, extension work.....	77
Entomology, research	39

	PAGE
Extension, field activities, summary of.....	51
Extension schools	35
Extension Service	46
Extension staff	31
Extension Teaching, departmental notes.....	36
Extension teaching, state policy in.....	62
F	
Faculty. <i>See</i> Staff.	
Fair exhibits	48, 49
Farm bureaus	53
Farmers' Field Days. <i>See</i> Field Days.	
Farmers' reading series.....	58
Farmers' Week	47
Farm Practices departmental notes.....	36
Farm study courses	56
Farrand, Livingston, letter of transmittal.....	11
Fellowships, industrial	19
Fernow, B. E., obituary notice	24
Field Days	48
Financial summary	98
Fish culture, studies in.....	31
Floriculture and Ornamental Horticulture, departmental notes.....	27
Floriculture and Ornamental Horticulture, extension work.....	79
Forestry, departmental note.....	27
Forestry, extension work	80
Forestry, research	46
G	
Grange scholarships.....	30
Guba, E. F., appointment.....	21
H	
Hilton, W. A.....	26
Hoerner, G. R., resignation.....	20
Home Bureaus.....	55
Home Economics, School of, bill to designate as College.....	17
Home Economics, departmental note.....	27
Home Economics, extension work.....	81
I	
Industrial fellowships.....	19
Instructing staff.....	5
J	
Johnson, Emma, resignation.....	21
Junior extension.....	56
K	
Kent, O. B., resignation.....	30
L	
Land acquisitions.....	18
Legislative enactments.....	16
Library of college, conditions in.....	18
M	
Mammalogy, extension work in.....	77
Mann, A. R., report.....	13
Merger with New York Agricultural Experiment Station.....	13
Meek, H. B., appointment.....	21
Meteorology, departmental notes.....	28

PAGE

eteorology, extension work.....	96
eteorology, research.....	41
etzger, H. J., appointment.....	25
uenscher, W. C., appointment.....	21

N

eedham, J. G.....	26
ews service.....	57
ew York Agricultural Experiment Station, equipment of.....	16
ew York Agricultural Experiment Station, merger with.....	13
ew York State Bankers' Association scholarships.....	20
ew York State Grange scholarships.....	20

O

Ornithology, extension work in.....	77
-------------------------------------	----

P

Plant Breeding, extension work.....	88
Plant Breeding, research.....	41
Plant Pathology, departmental notes.....	28
Plant Pathology, extension work.....	75
Plant Pathology, research.....	42
Plants poisonous to livestock.....	26
Pomology, departmental notes.....	28
Pomology, extension work.....	89
Pomology, research.....	43
Poultry Husbandry, departmental notes.....	28
Poultry Husbandry, extension work.....	90
President's letter of transmittal.....	11
Publication, Office of.....	57
Publications, distribution of.....	57
Publications, list of.....	59
Publications, summary of.....	62

R

Randolph, F. H., appointment.....	21, 29
Randolph, L. F.....	25
Research activities of College.....	29
Rice, F. E., sabbatic leave.....	25
Rose, Flora.....	27
Rural Education, departmental notes.....	29
Rural Education, extension work.....	91
Rural Education, research.....	45
Rural Engineering, departmental notes.....	20
Rural Engineering, extension work.....	92
Rural Social Organization, departmental notes.....	29
Rural Social Organization, extension work.....	93
Rural Social Organization, research.....	45
Ruth, Albert.....	25

S

Scholarships	20
Small, J. K.....	25
Spray service.....	74
Staff, attendance at meetings of professional societies.....	21
Staff, changes in.....	20
Staff of instruction, extension, and experiment station.....	5
State Fair exhibits.....	48
Student enrollment.....	23
Summer instruction in biology.....	22
Summer School in Agriculture.....	22
Summer term, discontinuance of.....	22

	PAGE
T	
Teaching staff. <i>See</i> Instructing staff.	
Thatcher, R. W., appointed director of experiment stations.....	15
U	
Underwood, F. O., appointment.....	21
Upton, G. B.....	25
V	
Van Rensselaer, Martha.....	28
Vegetable Gardening, departmental notes.....	29
Vegetable Gardening, extension work.....	94
Vegetable Gardening, research.....	46
Vegetable research farm, Long Island.....	18
W	
Weather Bureau, extension work of.....	94
Weed eradication.....	21
Wiegand, Mrs. K. M.....	21

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State of New York

**New York State College of Agriculture
at Cornell University**

**Cornell University Agricultural Experiment Station
New York State Agricultural Experiment Station**

Thirty-Seventh Annual Report of the Dean 1924

LIVINGSTON FARRAND, President of the University

A. R. MANN,

Dean

R. W. THATCHER,

Director of Experiment Stations

CORNELIUS BETTEN,

Director of Resident Instruction

M. C. BURRITT,

Director of Extension

Transmitted to the Legislature January 15, 1925

Cornell Univ. Agri.
Experiment Station
2-6-1925

THIRTY-SEVENTH ANNUAL REPORT

of the

New York State College of Agriculture at Cornell
University, and of the Cornell University
Agricultural Experiment Station

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

Albany, January 15, 1925.

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Thirty-seventh Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,

Commissioner of Farms and Markets.

(3)

PRESIDENT'S LETTER OF TRANSMITTAL

July 28, 1924.

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Farms and Markets,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

The Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said university shall expend such moneys and use such property of the state in administering said college of agriculture as above provided, and shall report to the commissioner of agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said college of agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the year 1923-24 of the New York State College of Agriculture and the Agricultural Experiment Stations, signed by the Dean of the College and Stations, Mr. Albert R. Mann.

I commend the report as a whole to those who are interested in the progress of the knowledge of agriculture, in the processes of evolution and change in the methods and materials of agricultural education, and more especially in the public-service aspects of the work of a university in one of its important departments. Even a cursory examination of these pages will show the great extent and varied nature of the activities of a state college of agriculture of the present day. A more careful study will reveal the strength and the fundamental importance of the

forces which are constantly working to build up the agricultural industry and to preserve the integrity of the rural population, and, indeed, of the total population.

The report falls naturally into three parts: the activities which center about the resident and internal problems of the College as a teaching institution; the progress of knowledge through investigation and research; and the extension of the resources of the institution through innumerable channels, in direct service to the people of the State, especially those residing on the farms. In each of these major segments, distinct progress has been recorded during the year, as the report so clearly indicates. The concrete results in each of these divisions mark substantial advances for agriculture and country life.

I desire to express the appreciation of the University for the opportunity afforded it by the Legislature to enlarge its research and to enrich its curriculum in the fields of marketing and agricultural business administration. The State College has been under great pressure of demand to meet the more recent acute needs of agriculture in these fields, and it has made the most of the facilities hitherto available. These, however, were very inadequate. The generous grant by the Legislature of 1924 has released the University from its greatest limitations for progress in these fields of knowledge. The State College welcomes the larger responsibility and the corresponding opportunity which the new funds provide.

The College still is in urgent need of relief by legislative appropriation in two respects: the rapid completion of the building program, now so long delayed; and the raising of salaries to a level commensurate with the importance of the services, the standing of the institution, the dignity of the State, and the imperative needs of the staff. These are investments in productive enterprises which yield large returns in both the economic and the intellectual life of the commonwealth. It is highly essential that the State should deal with these situations at its State College at Cornell University more considerately and more nearly adequately. The College is placed at a very serious disadvantage by the continued inadequacy of its housing facilities; but it is no less embarrassed by the low salaries available to its staff. It is in the interests of the commonwealth, both immediately and permanently, to rectify these conditions.

I transmit this report as a faithful record of the stewardship of Cornell University in the administration of the public funds entrusted to it for the State College of Agriculture and for the agricultural experimental stations in connection therewith.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1923-24

June 30, 1924.

To the President of the University:

SIR: I have the honor to submit herewith a report of the New York State College of Agriculture and of the Agricultural Experiment Stations under the administration of Cornell University, for the fiscal year 1923-24.

The legislative enactments

Certain gains of distinct importance to the College were made at the 1924 session of the Legislature. The total appropriation for general maintenance and operation for the year 1924-25 was \$1,524,560, as compared with \$1,404,105 for the current year, a gain of \$120,455. From the standpoint of the salary scale this appropriation was unsatisfactory, as it included very little which could be applied to the adjustment of salaries. Inasmuch as the salary scale has never been brought to a standard commensurate with either the requirements of the institution or the importance of its service to the people, and in view of the continued denial of requests for salary increases, now rigidly adhered to with but slight adjustment for a period of four years, the failure of the Legislature of 1924 to give relief was a serious hardship. It has compelled the yielding-up of several positions, which could be spared only by distinct sacrifice, in order to make a number of imperative salary increases. The wholly inadequate salaries paid continue to constitute the most difficult problem with which the College has to deal in attempting to provide the State with educational service of a high order. This situation must be met by a more generous attitude with respect to salaries on the part of the Legislature if the State is to be saved from serious consequences in its State College of Agriculture. It is the intention to stress this need when the Legislature of 1925 convenes.

In a number of other respects the legislative grants provided distinct relief, notably in certain of the classified funds for general maintenance other than salaries. The items for fuel, equipment and supplies, repairs, and summer school, were chiefly benefited. The items for equipment and supplies and summer school are still inadequate, but the gains this year have been distinctly helpful.

For a number of years the beekeepers of the State have urged larger consideration of their needs. The matter has been presented to the Legislature repeatedly, the beekeepers themselves taking the major responsibility although fully supported by the college authorities because of the recognized importance of the industry. The efforts were successfully rewarded this year in provision for salaries for a professor of apiculture, who is to engage in research and resident instruction, and for an extension assistant professor. This makes adequate staff provision for the immediate requirements. There will need to be additional funds for further facilities.

The largest single new item in the appropriations received is one in the amount of \$45,000, to expand the research and teaching in market-

ing and to round out the facilities of the College so that a four-years course in agricultural business administration can be established. There has been urgent need for this work. The farmers' cooperative organizations, which are looking to the College to provide trained personnel for them, requested this appropriation and were particularly active and effective in promoting its course through the Legislature. This educational enterprise is more fully discussed in the next section of this report.

In addition to the foregoing appropriations for the general operations of the College, a grant of \$5000 was made to provide an emergency heating system in the greenhouses.

A special bill of great importance to the extension service was passed and was made a law by the signature of the Governor. It specifically commits the State to the development of junior extension, or boys' and girls' club work, on substantially the same basis as is now provided for the county agricultural and the home demonstration agent services. For many years the State has appropriated annually \$600 for each county which meets the requirements fixed by the College for the employment of a resident county agricultural agent, and similarly \$500 for each county for the employment of a home demonstration agent. The law in question raises the state allotment for the home demonstration agents to \$600 a county, authorizes the employment of junior extension agents in each county that shall qualify, and authorizes state aid at \$600 a county for such agents. Inasmuch as the junior extension service has already laid strong hold on the people, many county boards of supervisors are making specific appropriations for the work, and there are already approximately 15,000 boys and girls enrolled for specific farm and home projects, this backing by the State will give impetus to the work and do much to insure its permanency. It provides for the completion of the county extension force as now contemplated. Experience has shown that the work with farm girls and boys is one of the most promising and forward-looking of the extension enterprises.

The above-mentioned law also makes certain other provisions of advantage to the three lines of work covered by it. Chief among these is a requirement that no county may receive the allotment of \$600 for any one of the three kinds of work until the county has raised, either by appropriations made by the board of supervisors or otherwise, \$2500 of local funds for that work. Thus a county receiving state aid in all three phases must provide at least \$7500 of local funds.

The bill to designate the School of Home Economics as the State College of Home Economics, which has been before the Legislature for four years, passed the Assembly without a dissenting vote, and was on order of final passage in the Senate in the closing session of the year. At the last moment, when its passage seemed assured, objection by the Senator from Onondaga County caused its reference to the Finance Committee, from which there was no opportunity to report it since that committee had no further meeting. The bill is sound in principle, is in accord both with a wise state policy and with the highest interests of the work which the State is supporting at this institution, and is generally acceptable. It should become a law. There is encouragement to believe that the best judgment and the larger interests of the State will yet prevail and secure its passage.

The work in marketing and agricultural business administration

Reference has already been made to the action of the Legislature in making an appropriation for developing research and courses of instruction in marketing and in agricultural business administration. Students have heretofore entered these lines of work, in considerable numbers, with such training as the College has been able to furnish, which was wholly inadequate. The enlargement of this field of education and research has constituted one of the most pressing needs of the College. It is now provided for, in so far as immediate requirements are concerned.

The primary aim of the new work will be to bring to bear on the problems of marketing the same painstaking investigation that has, through a long period, been given more largely to the problems of production. Farm crops and animals have long been studied with the purpose of securing improvement in kind and improvement in the methods of culture and care. Farm management studies have analyzed the farm practices and business methods that have made it possible for some farmers to produce crops with less labor and cost than others. There are equally great differences in the cost of getting the products from the farm to the consumer, and a similar analysis should indicate the best procedures. Studies will be made also of the kinds of agencies best adapted to the various steps in the marketing process, and of the organization and management of these agencies.

While it will take time to develop this new activity in the College, new courses in accounting, cooperation, marketing, and business management are already being organized and the necessary additions to the staff recruited, so that, in conjunction with the courses previously in operation, the new courses will constitute a curriculum practically sufficient for the needs of students specializing in marketing and agricultural business.

Special temporary fellowships, and other gifts or grants

During the year covered by this report, the following special temporary fellowships have been established or renewed:

(1) By the Union Sulphur Company, renewal of the two Herman Frasch fellowships, each providing \$2000 a year, for the investigation and development of dusting as a means of applying fungicides and insecticides in dry form.

(2) By the Union Sulphur Company, a temporary annual grant of \$1000 a year for the purpose of investigating and demonstrating the possibility of controlling cereal rust by the application of fungicides in dry form.

(3) By the Western New York Farms Corporation and the Orleans-Genesee Vegetable Growers' Association, a temporary annual grant of \$1000 for the establishment of the Western New York Farms Corporation Fellowship, for the purpose of investigating and demonstrating the nature and control of injurious diseases and pests attacking muck-land crops in western New York.

(4) By the Bayer Company, Inc., a temporary annual grant of \$1000 for the establishment of the Bayer Fellowship, for the purpose of investigating and demonstrating the value of chlorophenolate of mercury in comparison with other new and standard disinfectants for plant-disease control and plant stimulation.

A gift of \$2500 was received from the Honorable George D. Pratt, of New York City, to finance investigations in the raising of insect food for young pheasants. Mr. Pratt is a recognized constructive leader in wild-life conservation. His gift, to carry forward a promising investigation on which Dr. J. G. Needham was engaged, is received with appreciation.

The New York State Bankers' Association continued its generous aid to the junior extension service by again providing the achievement medals at an approximate cost of \$1000, and again appropriating \$1000 for five scholarships, of a value of \$200 each, to enable winners in the junior extension projects to attend the state agricultural college or the state schools of agriculture.

The New York State Grange has continued its provision for twelve scholarships, of a value of \$50 each, available on competitive examination, to members of the order who may desire to enroll for the winter courses.

During the past year the University has sold, somewhat above par, the shares of railway stock donated by Mr. Charles H. Roberts in 1906 for the establishment of five scholarships. As reinvested the sum will now permit raising the amount of each of these scholarships from \$240 to \$320 a year. Since their establishment these scholarships have afforded greatly needed and appreciated help to worthy students, and it is well that their usefulness is thus to be augmented.

For some years the Department of Forestry has awarded to the member of the senior class who has maintained the best all-round record during his course, a prize donated by Mr. Charles Lathrop Pack. During the past year Mr. Pack has increased the fund for this prize to \$1000, and has further donated \$1000 for establishing another annual prize, the purpose being "to aid in training foresters to write articles which will arouse in the public an interest in forestry and an appreciation of what forestry means to the country." Mr. Pack's generous gifts have been highly useful, and the College welcomes the additions that have been made.

Buildings and lands

The past year has seen the substantial completion of the architect's plans for the plant industry building and the library, and it is anticipated that bids for their erection will be invited during the summer or early fall. Relief from an overcrowding which is seriously hampering the work of the College awaits the erection of these buildings. It is highly important that every effort be made to avoid further delay.

While the plant industry building is the one whose construction has been urged for the longest period of years, beginning with 1913, and the one that will afford the greatest space relief to the College as a whole, the immediate erection of the library building is no less important. The college library is growing steadily in use, size, and value. In recent years a special effort has been made to add the more significant foreign works in agricultural science and related fields, and important acquisitions have been made. The continued housing of the main deposits in a non-fireproof building is a risk greater than should be borne by an institution of this character, in which the library plays so vital a part. Also the administration of the library is made difficult, and in many respects unsatisfactory

and cumbersome, because of the scattered location of sections of the collections, necessitated by the wholly inadequate space in Stone Hall. During the past year a small amount of relief was gained by readjustments following the occupancy of the new building for the dairy industries.

The erection of these two buildings will necessitate the destruction of a considerable section of the greenhouse range. The architect's plans are practically completed for the reestablishment of the houses thus disturbed, in what will constitute a new range for vegetable gardening, floriculture, and ornamental horticulture, on the plateau north of the university barns. Plans are advanced also for the reorganization of such parts of the existing range as it is practicable to leave in the present location.

The new building for the dairy industries was completed in the summer of 1923, in time for occupancy prior to the opening of the fall term. In space, arrangement, and equipment it is satisfactory in the highest degree, and amply meets the requirements of this important phase of the college work. The building was formally dedicated on October 12 and 13, 1923. The occasion was honored by the attendance of nearly ninety distinguished dairy scientists from all parts of the world, who came to Ithaca from the sessions of the World's Dairy Congress which had just completed its meetings in Washington, Philadelphia, and Syracuse. Mr. Robert Wallace, Professor Emeritus of the University of Edinburgh, spoke for the members of the Congress. The dedicatory address was delivered by Dr. H. E. Russell, Dean of the College of Agriculture of the University of Wisconsin.

Of small farm structures, for many of which the College still has great need, there were erected during the year a drying-shed on Caldwell Field, for the experimental work in agronomy, and a barn, a greenhouse, and an extensive water system on the new floricultural grounds.

The University purchased the J. W. Preswick farm on the Ellis Hollow Road, consisting of a dwelling, barns, and fifty acres of land, in order to provide a desired addition to the college domain. It joins land already owned by the University.

While the erection of the plant industry and library buildings will add substantially to the housing facilities, many large and important departments will remain in quarters wholly unsuited to their work and grossly inadequate. It is of the highest importance that the State should go steadily forward with the entire building program which has been placed before it and officially recognized by the Legislature.

Changes in the college staff

I have to report the following resignations from the professorial staff during the year: L. J. Norton, Assistant Professor of Agricultural Economics, July 1, 1923; Miss Ellen A. Reynolds, Assistant Professor of Home Economics, January 30, 1924; G. Harris Collingwood, Extension Assistant Professor of Forestry, June 30, 1924; G. A. Boutelle, Extension Assistant Professor of Animal Husbandry, June 30, 1924.

The staff has been strengthened during the year by the following additions, all of them persons of excellent professional training and a record of successful experience: Dr. Bruce L. Melvin, Acting Professor of

Rural Social Organization, October 1, 1923; Ralph A. Felton, Extension Professor of Rural Social Organization, October 1, 1923; Dr. James Morgan Sherman, Professor, and head of the Department of Dairy Industry, December 1, 1924, replacing in the latter post Professor W. A. Stocking, who retired from the headship to a teaching professorship after many years of arduous, devoted, and successful administration of the affairs of the department; E. J. Anderson, Acting Assistant Professor of Rural Education for one term, January 25, 1924.

Effective with the beginning of the academic year 1924-25, the following appointments have been approved by the trustees: Dr. Ivan Clifford Hall, of the University of California, Professor of Bacteriology in the Department of Dairy Industry; Dr. Everett Franklin Phillips, of the United States Department of Agriculture, Professor of Apiculture in the Department of Entomology; Dr. H. A. Ross, of the University of Illinois, Assistant Professor of Marketing in the Department of Agricultural Economics and Farm Management for the first semester of 1924-25.

The directorship of extension

On June 30, 1924, Maurice Chase Burritt resigned his position as Director of Extension in order to fulfill a desire which he had cherished from the time of his graduation from the College in 1908, to return to the management of the farm of his boyhood at Hilton, New York, the ownership and direction of which he had retained. After three years of notably successful work as State County Agent Leader, during which period occurred the rapid rise and development of the farm bureau movement in this State, with its exacting problems of organization and direction, Professor Burritt was promoted in 1917 to the newly created position of Vice Director of Extension, and in 1923 he became Director of Extension. Throughout his period of service he demonstrated exceptional ability as an organizer and director. His frank, straightforward, clear, and convincing presentation of the essential factors in every situation, and his excellent sense of the practical situations to be served, made his leadership of the extension service invaluable. His ability was not only freely acknowledged by his associates in New York, but widely recognized throughout the country. His contribution was of a high order and its benefits will be lasting.

Effective on July 1, 1924, the trustees, on the recommendation of the Dean, appointed Dr. Carl E. Ladd to succeed Director Burritt. Dr. Ladd brings to the post an excellent experience in administrative work and an intimate acquaintance with the field of agricultural extension. He received the degree of bachelor of science in agriculture from Cornell University in 1912, and the degree of doctor of philosophy in 1915. Thereafter he served successively as Director of the State School of Agriculture at Delhi, Specialist in Agricultural Education in the State Department of Education, Director of the State School of Agriculture at Alfred University, and Extension Professor of Farm Management at Cornell University. In all of these positions he had direct contact with the extension service in the State. He is eminently qualified for the duties in the responsible position to which he has been appointed.

Professor Willard Winfield Rowlee, B.L., D.Sc.

It is with deep regret that I must record the death of Professor W. W. Rowlee, which occurred on August 8, 1923. Following a long period of service at Cornell University, beginning with his appointment in 1889 as an instructor in botany in the College of Arts and Sciences, Professor Rowlee was transferred to the State College of Agriculture on July 1, 1922, as Professor of Dendrology. He was a welcome addition to the staff, both because of his ability as a teacher, and for his gracious personality, which endeared him to all with whom he came in contact. It was the expectation that Professor Rowlee would devote his energies primarily to investigative work in the field of dendrology, with a limited amount of teaching. Steadily failing health largely prevented him from carrying out his plans, although during his first term with this College he gave instruction to advanced students. Also, during that period and later, he supervised the reclassification of the tropical and other wood specimens in the collections in the Department of Forestry, which he had enriched by the addition of a large collection that he had made prior to his transfer to the College. Professor Rowlee will be remembered as a man whose first thought was always for the welfare of the University, to which he devoted himself unsparingly throughout his long connection with it.

The enrollment of students

The enrollment of students in the College of Agriculture during the year 1923-24 is given below, in comparison with the figures for the preceding year. There is an increase in the lower classes and in the number of graduate students, which suggests the beginning of recovery from the agricultural depression, and a small decrease in the winter-course registration. The decrease in the registration for the summer school, which accounts for the decrease in the total enrollment, is due to the transfer of the summer work in physical training to the State Normal School at Cortland, discussed in last year's report.

	1922-23		1923-24
Freshmen	368		421
Sophomores	283		300
Juniors	230		233
Seniors	264		220
	<hr/>	1,145	<hr/>
Special students		39	
Winter-course students:			
Agriculture (general)	121		101
Dairy Industry	48		48
Poultry Husbandry	40		52
Fruit Growing	22		18
Flower Growing	16		19
Vegetable Gardening	7		2
Home Economics (not offered in either year) ....			....
	<hr/>	254	<hr/>
Graduate students		180	
Summer-school students		992	
		<hr/>	<hr/>
		2,619	2,236
Less number counted twice		145	100
		<hr/>	<hr/>
		2,474	2,136
		<hr/>	<hr/>

Special conventions

During the year the following events were held at the College, varying in length from two to seven days, with an attendance of visitors as noted:

	Attendance
Annual conference of extension workers.....	164
Visit of World's Dairy Congress delegates.....	90
Conference of rural teachers (Annual Meeting of the Association of Agricultural Teachers of New York).....	135
Advertising agents of farm papers.....	25-30
Conference of canners' field men.....	46
1923 poultry judging school.....	126
1923 poultry production exhibition.....	} 66 exhibitors 1,027 birds
Home economics extension conference.....	
Junior field days	175 (27 States)
1924 Farmers' Week	1,001
State Federation of Horticultural Clubs.....	3,551
School of fertilizer salesmen.....	35
Indian farmers' field days.....	65
	61

Class absences and grades

Two items of faculty action may be recorded as of general interest. The very real abuse of absence on the part of students on days immediately preceding and following vacations was dealt with by the university faculty some years ago by the imposition of fines for unexcused absences on these days. This measure has not found great favor with either the faculty or the student body, and the university faculty has recently removed the fines. Whatever the merits or demerits of the plan, a record should be made of its working in this College. The following tabulation indicates the amount of excused and unexcused absences with and without fines. While there are certain considerations discounting the results, there can be little question of the general conclusion that the fines substantially reduced the number of absences:

	1915-16 No fine	1919-20 Fine	1920-21 Fine	1921-22 Fine	1923-24 No fine
Christmas recess:					
Percentage of days of excused absence..	1.8	2.3	2.4	3.5	2.3
Percentage of days of unexcused absence	9.4	1.1	1.0	0.99	7.3
Spring recess:					
Percentage of days of excused absence..	...	3.0	3.0	3.2	2.7
Percentage of days of unexcused absence	...	0.7	0.8	0.7	9.1

In 1916 the faculty adopted the so-called "Missouri plan" of giving credit toward graduation varying with the grade of work done. With five passing grades, the medium grade of C carries normal credit, A carries twenty per cent and B ten per cent increased credit, and D and P carry ten and twenty per cent decreased credit, respectively. As a stimulus to good work, those who make excess credit averaging fifteen per cent, that is, an average midway between A and B, are allowed graduation on seven terms of residence if all specific requirements are met. The experience of several years shows that with the scale of grading maintained as it is by a faculty, the standard set for exemption for a term of residence is too high, since not a single student has qualified under this provision. The faculty is agreed that exceptional work merits such exemption, and

has therefore voted to allow it if the record averages B. It has determined also to limit a student's registration to fifteen hours a term if in the preceding term his grades average less than C, in order to prevent students from making up by rather heavy registration what has been lost by reason of the system of varying credit.

The directory of former students

In the annual report for 1921-22 a summary was given of the information gathered by Mr. Anson Wright Gibson, of the college staff, on the occupations of the graduates who had entered the College during the years 1906 to 1910, inclusive. Information of this character has now been compiled for all the students of the College up to June, 1923, and is brought together in an alumni directory, published during the current year.

The directory gives for each student the period of attendance at the College, the degree received, if any, and the present address and occupation so far as these were learned. Aside from its obvious usefulness in locating the alumni and in thus furthering contact between them and the College, the directory is valuable as constituting in a measure an analysis of the value of the training given by the College. The summary from the directory presents the salient facts:

MEN		
Total number of men listed in directory.....		4,685
Number of men graduated.....	2,539	
Number of men who did not graduate.....	2,146	
		<hr/> 4,685
Men graduates:		
Occupation reported	2,181	
Occupation not reported	266	
Deceased	90	
Retired from business	2	
		<hr/> 2,539
Classification of the 2,181 occupations reported:		
Farming — farm owners, renters, managers, and laborers.....	525	
Agricultural business — buying or selling agricultural products and supplies; with farmers' cooperatives; nurserymen; florists; manufacturing and preserving agricultural products; agricultural journalism and advertising; etc.....	284	
Agricultural and scientific professions — bacteriologists; entomologists; chemists; foresters; landscape architects; veterinarians; naturalists; etc.....	161	
Agricultural teaching, research, and extension — agricultural college and secondary school teachers; experiment station workers; county agents; county club agents; U. S. D. A. workers; etc.	602	
Non-agricultural work — all professional and non-professional men not engaged in work directly connected with some phase of agriculture, such as physicians, lawyers, accountants, bankers, manufacturers; etc.....	609	
		<hr/> 2,181
Men non-graduates (60 per cent of these men left the College by the end of their first year, and 85 per cent left by the end of their second year):		
Occupation reported	1,403	
Occupation not reported	557	
Deceased	172	
Retired from business	14	
		<hr/> 2,146

Classification of the 1,403 occupations reported:			
Farming	274		
Agricultural business	111		
Agricultural and scientific professions.....	42		
Agricultural teaching, research, and extension.....	65		
Non-agricultural work	911		
			1,403
WOMEN			
Total number of women listed in directory.....			999
Number of women graduated.....	590		
Number of women who did not graduate.....	409		
			999
Women graduates:			
Occupation reported	527		
Occupation not reported.....	53		
Deceased	10		
			590
Classification of the 527 occupations reported:			
Housewives and housekeepers.....	212		
Home economics and agricultural businesses and professions — dietitians; cafeteria or tea-room managers; managers of dining and residential halls; farmers; landscape gardeners; costume designers; etc.....	88		
Teaching, research, and extension work in home economics, agriculture, or science — college or secondary school teachers; home demonstration agents; junior project workers; welfare workers; etc.	171		
Work other than in home economics or agriculture, such as in clerical positions, librarians, journalism; etc.....	56		
			527
Women non-graduates:			
Occupation reported	293		
Occupation not reported.....	102		
Deceased	14		
			409
Classification of the 293 occupations reported:			
Housewives and housekeepers.....	128		
Home economics and agricultural businesses and professions..	25		
Teaching, research, and extension work in home economics, agriculture, or science	28		
Work other than in home economics or agriculture.....	112		
			293

The college farms

As there are frequent calls for information regarding the size, character, and use of the college farms, a detailed statement is included here regarding the present areas, using the names (largely the names of former owners) commonly employed for purposes of designating the several tracts:

LAND PURCHASED BY CORNELL UNIVERSITY AND PLACED UNDER THE MANAGEMENT OF THE STATE COLLEGE OF AGRICULTURE, TO AND INCLUDING JUNE, 1924

	Acres				
	Arable	Pasture	Woods and waste	Building and lots	Total
Mitchell farm	50	35	22	3	110
Preswick farm.....	18	24	21 (about)	4	67 (about)
Behrends farm .....	..	.....	44.5	.....	44.5
Blair farm	91	7	10 (fish hatchery)	3	111
Smith Gwynip farm.....	32	45	14	2	93
P. C. Cornell farm.....	15	.....	2	.....	17
*Ryan farm.....	90 (+30 to veteri- nary farm)	2	6	2	100
*Ostrander farm.....					
*Casey farm.....					
Comstock farm.....	..	.....	3.5 (tree nursery)	.....	3.5
Hasbrook farm.....	42	.....	8	.....	50
McDaniels farm.....	25	.....	5	.....	30
Boal farm.....	40	5	.....	5	50
Wait farm.....	..	128	10	5	143
Mitchell B. I. farm.....	20	.....	3.75	.....	23.75
Kline farm.....	12 (+12 to Country Club)	.....	1	.....	13
Warren farm.....					
Mead farm.....					
McGowan farm (rented).....	87	26	27	10	150
Plant-breeding garden.....	4	.....	..	.....	4
Snyder farm.....	47	.....	..	.....	47
Game farm (purchased by State).....	125	.....	36	5	166
Preswick farm.....	48	.....	1	1	50
	782	272	221.75	47	1,322.75
Arboretum.....	..	10	..	.....	10

*The Ryan, Ostrander, and Casey farms when purchased contained about 130 acres, of which 30 acres on the south side of the road are used by the Veterinary College.

	Acres
Total area	1,323
Owned by Cornell University.....	1,007
State-owned (game farm).....	166
Rented (McGowan farm).....	150
Classified as follows:	
Tillable	782
Pasture	272
Woods and waste.....	222
Buildings and lots.....	47

The tillable area is assigned as follows:

	Total (acres)	Used for experi- mental purposes (acres)
Agronomy	32	23
Animal Husbandry	16	..
Floriculture and Ornamental Horticulture.....	19	10
Plant Breeding	56	40
Pomology	64	50
Poultry	72	22
Vegetable Gardening	25	6
Farm Practice, for growing crops most of which are made available to the Department of Animal Husbandry	498	..

The Department of Forestry is assigned about 77 acres in woodlots, 25 per cent of which are used for experimental purposes.

The Department of Animal Husbandry has the use of the pasture and stock-runs in some of the woodlots, and lands along Fall Creek owned by Cornell University.

The Department of Entomology uses about five acres of waste land for a fish-culture experiment station.

The area classified as "used for experimental purposes" is approximate. It varies slightly from year to year, and occasionally, when the two can be combined without sacrifice, the experimental work is not differentiated from instruction.

The Office of Farm Practice has cooperated with subject-matter departments in obtaining experimental data on areas, totaling about 60 acres, which are not assigned permanently to departments.

Departmental notes

Botany. The Department of Botany reports that during the second term of 1923-24 it conducted an experiment in class sectioning in course 1, in which there were nearly two hundred students registered. The class was divided into twelve sections. To some of these sections students were assigned who ranked high in mental-ability tests; to others, students of medium and low mental-test scores. Some of the sections were filled with students of various grades in mental-ability tests, and these sections served as the checks in the experiments. The achievement of the students as compared with that in the first term, when the sections were formed at random, was measured, and the result showed, in general, a greater gain by the sections in which students of apparently equal ability were segregated than in the mixed sections. The department recognizes the need of further experimentation in this field, but the study of the past year was made with care and constitutes a worth-while contribution toward the solution of the problem.

Dairy Industry. The courses in the Department of Dairy Industry have been reorganized to a considerable degree, largely with the purpose of concentrating the work into fewer courses. It is thought that a gain has been made in the dairy courses themselves, and also in releasing more of the student's time for work in the basic sciences essential to the best work in dairy industry. The courses in bacteriology have been greatly strengthened. There will be a general introductory course for those planning to do advanced work in the department, and separate elementary courses for the special needs of students in general agriculture, home economics, and hotel administration.

In the month of April, Professor W. A. Stocking attended the International Dairy Exposition and Congress held at Milan, Italy. Following the Exposition, with its excellent display of European dairy products in particular, Professor Stocking visited dairy schools, experiment stations, and dairy plants, and studied methods of city milk distribution, in Italy, Switzerland, France, Austria, and England.

Floriculture and Ornamental Horticulture. Prior to the current year, students specializing in floriculture were held to meet the established farm-practice requirement. With the beginning of the present year a change was made, so that the requirement for these students is now met by equiva-

lent practice in greenhouse or nursery work. This modification promises to be advantageous to the students concerned, in preparing them more directly for their chosen work.

Forestry. The year 1924 marked the close of the first decade of the forest working plan for the woodlands on the college farm. Ten years ago, when these areas were taken over by the Department of Forestry, most of them were in poor condition. Since that time they have been under systematic forest management. The effect is noticeable both in the way of growth and in the composition of the species making up the stands. Although cuttings have been made each year, there is now a greater volume of wood standing than there was ten years ago. The working plan has now been revised. Its revision, on which both staff and graduate students worked, has been a valuable educational enterprise. The revised plan will guide the operations for the ensuing ten-years period.

In the autumn of 1923, a definite agreement was entered into between the College and the New York State Conservation Commission governing the conduct of the educational activities that have grown out of the white-pine blister-rust eradication undertaken by the State.

Representatives of the department have cooperated during the year in forwarding federal and state legislation having to do with the expansion of the federal forest policy and the establishment of a logical and comprehensive state-wide forest policy for New York. The most important result was the enactment by Congress of the McNary-Clarke bill, which provides very important and substantial enlargement of the national Forest Service in cooperation with the several States. Members of the forestry staff have given valuable aid in the preparation of a forestry policy for New York State, at the request of the Chairman of the State Senate Committee on Conservation, made to the New York Section of the Society of American Foresters. There is great need that this State shall revise and extend its policy in relation to the forest areas within its borders.

The greatest need of the Department of Forestry at Cornell University is for a college forest of approximately 2000 acres. Reference to this need has been made in previous reports. For the study of many forest problems, a forest under his sole control is as essential to the forester as is a laboratory to the chemist. Without a tract of forest land, sufficient in area to be representative of forest conditions and in the ownership of the University so as to exercise complete freedom of operation, the department is operating under a heavy handicap. Practically every other important forestry school in the country now has an extensive area of this character. The woodlots on the college farm serve many useful purposes, but they do not now, nor can they ever, take the place of a proper college forest. Arrangements with private owners of forest lands are of value and are taken advantage of, but uninterrupted continuity in the conduct of certain types of experiments is impossible without ownership and a large area available. In forest research the time element is a factor of controlling importance.

Home Economics. The School of Home Economics has had a total registration of 526 students in the past year. Of these 413 were in the regular four-years course, 88 of whom were taking the course in hotel administration; 11 were special students; 9 were students from other colleges in the University; and 93 were in the summer session.

The special course in hotel administration has progressed not only in numbers but also in the organization of the work. The American Hotel Association is continuing its support of the course, and the University has decided to charge tuition to this group of students whether or not they are residents of New York State.

Plant Breeding. Throughout the spring, Dr. R. A. Emerson, head of the Department of Plant Breeding, accompanied Mr. F. D. Richey, agronomist in charge of corn investigations of the United States Department of Agriculture, on a scientific expedition to Argentina, Chile, Peru, and Bolivia. The purpose was to make observations on corn-growing in those countries, to collect samples of varieties of corn growing in high altitudes or at low temperatures, to seek varieties resistant to diseases, insects, and drought, and to assemble types of promising value in the study of the genetics of corn, on which Dr. Emerson has long been engaged. In all, some two hundred samples were collected, and it is felt that the expedition was highly successful. It is anticipated that some of the varieties will be adapted to the northern parts and the higher altitudes of the United States, and that valuable stock for breeding experiments has been assembled.

Pomology. The Department of Pomology is making practically no change in its teaching program for the year, beyond adding an hour's credit to three of its major courses. The department has confined its teaching very strongly to subject matter based on experimental evidence, and the addition of credit hours in the courses is forced by the newer results of research in the field of pomology.

The department has limited its teaching in another way by dealing only with those phases of fruit growing with which the instructor has intimate contact through research activity or field experience. Thus the subjects of insect and fungus control in relation to fruit growing, except for elementary consideration in the introductory course, are left to the Departments of Entomology and Plant Pathology. The department reports that this practice is on the whole satisfactory. It constitutes, nevertheless, a basic problem in the organization of courses and departments. Shall we in the main make the crop or the animal or the farm the unit of instruction, or shall we attack from the point of view of basic biological and economic processes involved, leaving the student to a large extent responsible for making synthesis of what he learns? This is a problem to which we need to give attention.

Poultry Husbandry. In the month of May, Dr. G. F. Heuser attended the second World's Poultry Congress, held at Barcelona, Spain, as a representative of the International Association of Poultry Instructors and Investigators, of which he is the secretary, and of the New York State College of Agriculture. The Congress consisted of a large exhibition and a series of meetings of delegates for the consideration of scientific papers, about 100 in number. The exhibit sent from the United States was composed of units provided by ten agricultural colleges, including our own, and it emphasized the progress of education and research in fields of poultry husbandry. The Congress enrolled 350 delegates from twenty-six countries. Following the Congress, the American delegation

visited important poultry establishments in England and France. The Congress proved highly beneficial to the delegates in the new methods and materials of poultry production which were presented.

Rural Education. The teaching program in rural education has been much as in the preceding year. The course for members of the college staff was successfully started, Professor Kruse giving work in educational psychology for college teachers. The absence of Professor Works during the second term made it impossible to give the second-term work in the problems of agricultural teaching. Both courses will be in operation for members of the faculty during the coming year.

The department urges that the phases of elementary rural education which have to do with teacher preparation and curricula be developed as early as possible. It suggests also that some provision be made by which the Rural School Leaflet may be sold to interested persons outside the State. The demand for this publication cannot be met from our present editions, and many persons express a willingness to purchase it. It is clearly unfortunate that this wider usefulness for the Leaflet has not been established.

Rural Engineering. The main changes in the teaching program of the Department of Rural Engineering are the addition of a course in gas engines and another in farm concrete, and the opening of the farm-shop course to all students of the College. It has long been desired to have the shop work available to all students, but until this year the course has derived support from the Smith-Hughes funds and this has precluded the admission of students other than prospective teachers.

The department reports gratifying success in certain changes in teaching method, and in the plan of arranging students in class sections according to proved ability.

Rural Social Organization. The number of registrations in the relatively new Department of Rural Social Organization shows an increase, during the past four years, of undergraduates from 35 to 56, 77, and 78, and of graduate students from 6 to 19, 19, and 31, in the successive years.

RESEARCH ACTIVITIES AND EXPERIMENT STATION WORK

The merging of the administration of the New York Agricultural Experiment Station at Geneva with the experiment station of the State College of Agriculture at Ithaca, as outlined in the report of a year ago, makes it possible now to consider all of the agricultural research and experimental work of the institution as a unit. Already the advantages of this are becoming apparent. It is now easier than it has been in the past to arrange for cooperative study, by members of the different staffs, of such problems as need for their solution the contribution from different sciences or the experience of workers with different backgrounds. It is also easier to avoid duplication of staff, equipment, or effort in research, and to consider the entire field of research activities of the institution as a single well-coordinated program. And, finally, a fine *esprit de corps* of the research workers has been promoted by the development of a common feeling of mutual interest.

WORK AT OUTLYING STATIONS

Agronomy experimental fields. Two experimental fields in agronomy are maintained, one at Alfred and one at Churchville, for the study of crop rotations and of responses to fertilizer treatments. It is hoped that from time to time additional fields will be provided, until each major soil type of the State is represented by an experimental plot on which the results of laboratory studies can be tested in field practice. These tracts serve as field laboratories where the applicability of scientific principles of soil management and crop production to the local agricultural needs presented by the different soil types of the State can be tested under carefully controlled conditions.

Experimental vineyards. The leases for the two experimental vineyards at Urbana and Fredonia, respectively, which would otherwise have terminated this year (after having been in force for ten years), have been renewed for another five-years period. At Urbana a tract of twenty-two acres, mostly in bearing vineyard, is being used for the study of vineyard fertilization and varietal adaptation. The original plan of using this vineyard for the development of grapes especially adapted for wine-making has been abandoned, and the experimental work is now concerned with the production of grapes for market. At Fredonia a tract of thirty-five acres is devoted to a considerable variety of studies of vineyard management, including the use of cover crops, intertillage, fertilization, pruning, and pest control, and also to special studies of propagation from hardy stocks, breeding of new varieties, and varietal adaption. The Legislature of 1924 made provision for the erection of a packing and storage shed at Fredonia.

Hudson River Valley horticultural investigations. The horticultural investigations in the Hudson River Valley were made possible by a special appropriation by the Legislature of 1923. Contracts have been entered into for four tracts of land located at different places in Columbia and Dutchess Counties, on which experimental studies of orchard and vineyard fertilization and pruning have been started. A fifth tract, near Kinderhook, is being used in a study of methods of development of a young orchard on a particular type of soil which formerly was productive but for nearly a century past has been practically abandoned as far as agricultural use is concerned. A laboratory for the study of the insect pests and plant diseases which are peculiar to that part of the State, particularly those which are introduced through the New York City port of entry and tend to spread up the Hudson Valley, has been established on the campus of Vassar College at Poughkeepsie. The experience of the first year indicates that very valuable service to the horticultural interests of the eastern part of the State will undoubtedly result from the establishment of these local experimental units.

Long Island vegetable research farm. The Long Island vegetable research farm, for which provision was made by the Legislature of 1922, is now well established. The work of the first year was necessarily devoted largely to providing proper facilities for field and laboratory study of the many problems of vegetable growing on Long Island. The work of the second year has produced very definite results in the acquiring of knowledge concerning proper methods of control of special diseases and insect

pests of cauliflower, cucumbers, and potatoes. Some of these results have already been published, and others are nearly ready for publication. Further, certain problems of soil treatment and management for the production of vegetable crops have become clearly defined and experimental study of them has been begun. It is apparent that this research farm will successfully meet the special need in response to which it was established.

THE STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

In continuation of the practice which has prevailed ever since the New York Agricultural Experiment Station at Geneva was established, a detailed report of its activities for the year ending June 30, 1924, will be published separately as the Forty-third Annual Report of that station. It is necessary to say here only that the year has been a very successful one, both in the addition of facilities for research and in the volume of experimental work which has been brought to a definite conclusion.

The Geneva station has now fully recovered from the interruption to its work which was caused by the World War, and the members of its staff are again actively and enthusiastically at work on investigations such as have brought in the past such useful results to agricultural science and practice and such honorable attention to the station.

The veto by the Governor of the appropriation made by the Legislature of 1924 for the new horticultural research laboratory, on the ground that "while this is undoubtedly a desirable addition to the State's building equipment, it is not imperative at this time," was a serious disappointment to all the friends of the station and to those who realize how great would be the returns to the State from the results of the added research which this building would have made possible. The members of the staff have rallied loyally from this disappointment, however, and are striving earnestly to make the best possible use of their present limited equipment, with the hope that more adequate facilities may be available in the not far distant future. The appropriation for the building should be requested again of the Legislature of 1925.

RESEARCH ACTIVITIES AT ITHACA

The research activities of the staff at Ithaca are of two general types. There is, first, the study of problems of agricultural science and practice in response to needs presented by farmers of the State through correspondence with members of the staff or through the Extension Service. This is supported by federal funds and by state funds which have been used in continuation of the work of the Cornell University Agricultural Experiment Station. In addition, there is the study of problems which arise in connection with classroom instruction in agriculture, either in the applied industry courses or in those of the basic sciences, and in connection with the instruction in methods of research of the large numbers of graduate students in agriculture at Cornell University. This is supported by state appropriations for instruction and research at the New York State College of Agriculture. These two types of research often deal with the same materials and facts, and, if properly conducted, should

lead to identical conclusions, most of which ultimately will be put into practice on American farms or will affect the instruction in agricultural science in schools and colleges. But the organization of the staffs for the two types of research is somewhat different, and the method of carrying on the investigations varies somewhat depending upon the immediate purpose. Hence it is not feasible nor desirable to attempt as close an administrative supervision, or as definite an organization on the project basis, of all the research activities of the staff of the College of Agriculture, as is generally done in a separately organized agricultural experiment station.

For this reason it is not possible to give at any one time a complete picture of the research activities which are in progress in any given department of the College at that time, and the reports by departments as given below are confined to brief statements of the matters which were brought to the point of publication during the year. There are, however, certain general statements concerning increased facilities and definite progress or new plans for research, which may be presented here as indicating progress made during the year.

The equipment of the laboratories for the study of the nutrition of human beings, farm animals, and poultry, respectively, was brought to an excellent state of efficiency, and several preliminary problems of technique have been worked out, so that real progress in these fields may be confidently expected in the near future.

The equipment of the new dairy industry building was brought nearly to completion early in the year, and the staff of the department has been reorganized so as to differentiate more sharply between teaching, research and extension activities. Facilities for fundamental studies in dairy bacteriology and dairy chemistry are now being provided.

A beginning was made in the providing of facilities for the study of problems in hotel management, as an application of home economics investigations, but a proposal of the American Hotel Association to transfer to the College of Agriculture all of the activities of its research bureau was considered to be not feasible nor wise under present conditions.

The completion of a suitable cold-storage plant, and the installation of accompanying equipment for the measurement of respiration and of chemical changes in fruits, has greatly enhanced the opportunities for study of storage problems with fruit.

Additions to the museum material in entomology, as a result of collecting expeditions to South America and elsewhere, have greatly increased the opportunities for systematic study of groups of insects, both economic and non-economic. The investigations in fish culture, referred to in the report of last year, have largely recovered from the losses occasioned by the flood of August, 1922, and are producing definite results, particularly in methods of production of artificial food for young fry of desirable species.

A journey to South America made by the head of the Department of Plant Breeding and a representative of the Office of Cereal Investigation of the United States Department of Agriculture, resulted in the procuring of nearly two hundred samples of corn grown at high altitudes and under conditions of low mean temperatures, which will be used in the study of genetic factors of hardness in corn, and in breeding for new varieties adapted to northern conditions.

Cooperative investigations by the plant pathologists and entomologists at both the Cornell and Geneva stations, of the comparative efficiency of dusting and spraying for the control of plant diseases and insect pests of fruits and vegetables, have proceeded to a point where some of the controversial questions can be answered, and it seems probable that definite and uniform advice on this general problem can be agreed upon by all of our station workers in the near future.

A study of long duration by members of the Department of Botany has culminated in the presentation for publication of an extensive monograph on the flora of the Cayuga Lake Basin.

Another long-time investigation dealing with the feeding of grain to work horses was brought to a conclusion during the year.

An extensive study of the factors which influence the movements of rural populations, particularly of the scale of living on farms of different types and of the expenditures which farmers make from their income, has been definitely organized and is making excellent progress.

The investigations of various phases of the business management of farms have reached a point where an evaluation of the influence of many factors on the success of the farm enterprise is possible. This has resulted in the inauguration of a monthly bulletin entitled "Farm Economics," which presents a general picture of the conditions that affect farm business each month. Studies of rural credit have also reached a point which makes it possible to give definite recommendations concerning these matters.

Other significant and positive results of research activities of the staff during the year are indicated in the following list of papers that have been prepared for publication.

Bulletins and papers published during the year

The following is a brief review of the research activities of the several departments during the past year, in so far as the work has proceeded to the point of preparation for publication.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management, the following papers have been published:

R. L. Gillett—A study of farm labor in Seneca County, New York. New York State Department of Farms and Markets. Bul. 164. 1924.

A study of the source of farm labor, the seasonal distribution of work, the length of the working day, and factors affecting efficiency in the use of labor, is discussed in this bulletin.

V. B. Hart—Farm motor trucks in New York. Cornell Univ. Agr. Exp. Sta. Bul. 427. 1924.

This bulletin gives the results of a study of the use of motor trucks in transporting farm products and farm supplies; the costs of operation and the advantages and disadvantages of this mode of transportation; and its effects on agriculture.

E. C. Young—The movement of farm population. Cornell Univ. Agr. Exp. Sta. Bul. 426. 1923.

A study of the movement of population from farm to farm and between farms and cities, and the various factors affecting such movement, is reported in this bulletin.

The following manuscripts have been accepted for publication as bulletins of the Experiment Station:

- E. G. Misner — An economic study of dairying on 163 farms in Herkimer County, New York.
 E. G. Misner — Economic studies of dairy farming in New York. II. Grade A milk with and without cash crops.
 C. V. Noble — The cost of living in a small factory town.
 Leland Spencer — An economic study of rural store credit in New York.

The following papers are ready for publication:

- R. W. Bartlett — Cooperative fire insurance in New York.
 E. G. Misner — Economic studies of dairy farming in New York. III. Grade B milk with alfalfa roughage.
 W. I. Myers — Farm credit.
 L. Spencer and L. J. Norton — Milk marketing in New York.

Agronomy

In the Department of Agronomy, the following papers have been published:

- H. D. Brown — Sulfonation in pure and mixed cultures, with special reference to sulfate production, hydrogen-ion concentration, and nitrification. *Amer. Soc. Agron. Journ.* 15:350-382. 1923.

It has been known that when sulfur is added to the soil there is shortly an increase in the sulfate present. A series of experiments was designed, to show what effect this oxidation process has on barley grown on the soil. Methods were developed for the isolation and growth of the sulfur-oxidizing organism, and what is possibly a new sulfur-oxidizing organism was isolated and described. The relation of sulfur oxidation in soil to the nitrogen changes showed no loss in total nitrogen, but an application of 100 pounds of sulfur per acre retarded the accumulation of nitrates. Application of calcium carbonate tended to alleviate this depressing effect of sulfur. The growth of barley was materially retarded where sulfur was applied without calcium, and this was accompanied by an increase of acidity in the soil, which was overcome in part by the application of calcium carbonate.

- T. L. Lyon, J. A. Bizzell, and B. D. Wilson — Depressive influence of certain higher plants on the accumulation of nitrates in soil. *Amer. Soc. Agron. Journ.* 15:457-467. 1923.

Several investigators have observed that the disappearance of nitrates in soil on which plants are growing may not always be accounted for by the quantity of nitrogen absorbed by the plants. Previous experiments by the writers, as well as those here recorded, confirm this observation. An experiment is here described in which there were incorporated in the soil contained in drainage cans, roots of oats, maize, timothy, and red clover, and dried blood, respectively. The weights of the roots were so adjusted that each kind of roots contained equal quantities of nitrogen. The mixtures stood in the cans for three months, during which time they were occasionally leached and the nitrates in the leachings determined. The quantities of nitrates recovered from the different roots and dried blood were directly in the order of the percentage of nitrogen in these substances. The authors suggest that the carbonaceous matter liberated by the roots of living plants may favor the development of nitrate-consuming organisms in the soil, with a consequent loss of nitrates, the nitrates being converted into other compounds. The difference shown by plants of various kinds, in respect to the extent to which they cause a disappearance of nitrate, may result from a difference in the composition of the exudate from the roots of plants, those of higher nitrogen content liberating a substance less rich in carbohydrates, which might be expected to be less encouraging to the nitrate-consuming bacteria. It is not held that living plants liberate organic matter in all soils, but that they do in nutrient solutions, and probably in the heavy clay loam used in these experiments. Under such conditions the disappearance of nitrates under certain crops may be accounted for by the biological processes here mentioned.

- F. L. Lyon, J. A. Bizzell, and B. D. Wilson—An inquiry into the reason for the large accumulation of nitrates in soil following the growth of clover or alfalfa. Amer. Soc. Agron. Journ. 16:396-405. 1924.

It has been rather common to assume that the beneficial effect of the growth of clover on the productiveness of soil is due to the store of nitrogen which it lays up in the soil as a result of its fixation of this element from the atmosphere. While there may usually be an increase in the nitrogen content of soil resulting from the growth of leguminous plants, this is not always the case. It was with the purpose of attempting to determine why nitrate nitrogen is more abundant in a soil following the growth of clover or alfalfa than following the growth of timothy, that the experiments described herein were begun. It appears that the rapid and large accumulation of nitrates in soil previously planted to clover or alfalfa, as compared with that in soil previously in timothy, is connected with the higher nitrogen content of the former legumes. It is not necessarily associated with a larger total quantity of nitrogen in the legume soil, but rather with its smaller quantity of non-nitrogenous organic matter (probably carbohydrates). It is well known that non-nitrogenous organic matter furnishes a source of energy for the organisms which transform the nitrogen of soil nitrates into other nitrogen compounds. This source of energy being present in smaller quantity in the residues of these legumes than in the residue from timothy, there is less destruction of nitrates in soil previously planted to clover or alfalfa than in soil previously in timothy. It seems probable also that this may be a factor in determining the effect which other crop residues exert on nitrate accumulation, and thus on the supply of available nitrogen for succeeding crops.

- T. L. Lyon and H. O. Buckman—Edaphology. Amer. Soc. Agron. Journ. Journ. 16:96-103. 1924.

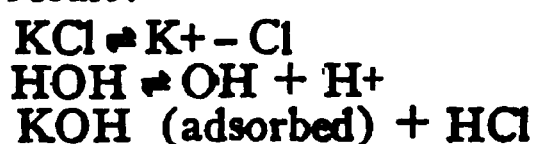
The word *edaphology* is proposed, and its use urged, as a term to mean the study of the nature and properties of soils in their relation to plant growth. The term is derived from the Greek word *edaphos*, meaning ground, foundation, base. Attention is called to the fact that the term *edaphic* is now used by botanists to denote the relation of the plant to its soil environment, and that *edaphology* would therefore connote the plant relationship. There is now no one word which stands for the subject as defined above. As an alternative the term *edaphics* is presented.

- T. L. Lyon and H. O. Buckman—Availability of the phosphorus of floats as influenced by incorporation of farm manure in the soil. Amer. Soc. Agron. Journ. 16:96-103. 1924.

Field experiments covering a period of nine years were conducted, with the purpose of studying the effect of decomposing organic matter on the availability of the phosphorus in floats. The soil was a clay loam and was limed to satisfy its requirement. One set of plats received farm manure as a basic treatment. In addition to this there were applied to different plats varying quantities of acid phosphate or ground Florida phosphate rock. The applications of acid phosphate were in quantities of 100, 200, and 400 pounds to the acre. Of floats there were 200, 400, 800, and 2400 pounds applied. Another set of plats received no farm manure, but a basic treatment of nitrate of soda and muriate of potash. To these plats acid phosphate or floats were applied in somewhat fewer treatments. The application of floats to the manure-treated plats resulted in a larger crop yield for every increment in the quantity of floats applied. Of the plats receiving nitrate of soda and muriate of potash as a basic treatment, the initial application of floats produced an increased crop yield but the larger application did not give any increased yield beyond that resulting from the initial amount. Nor were the yields from either application of floats to the latter basic treatment as large as those obtained by similar applications of floats to the former basic treatment. In view of the fact that acid phosphate was as effective on one basic treatment as on the other, it is believed that the larger yields from floats when used with manure were due to the favorable action of the decomposing organic matter in rendering the floats available.

- C. O. Swanson—Soil reaction in relation to calcium adsorption. Journ. agr. research 26:83-123. 1923.

One object in undertaking the experiments discussed in this paper was a desire on the part of the author to overcome some of the difficulties encountered in the use of the hydrogen electrode for the determination of P_H values for soil suspensions. Another object was to study some of the phenomena associated with the adsorption of calcium when added to the soil in the form of a $\text{Ca}(\text{OH})_2$ solution. The potentiometer described by Hildebrand was used, with some modifications. In comparisons of P_H values in soil extracts and suspensions, the hydrogen-ion concentrations were greater in the suspensions except where there was an excess of hydroxyl ions. The author concludes that the acid-forming substances vary in solubility. $\text{Ca}(\text{OH})_2$ was added to soils in various quantities, and the P_H values and unadsorbed calcium were determined. This was done both in the presence and in the absence of KCl . The effect of the KCl was to increase the hydrogen-ion concentration, except in soils having a comparatively large amount of calcium. Additions of CaCO_3 at the same time did not change the action of the KCl . The author concludes that the following equations result:



Additions of CaCO_3 had no effect on the P_H values after 8.5 was reached from which it is concluded that the acid-producing substances liberated their hydrogen ions very slowly. Experiments on the influence of $\text{Ca}(\text{OH})_2$ and KCl on the P_H value when used on leached soils and ignited soils led to the statement that leaching increased the solubility of the acid-producing substances and decreased the absorption of Ca due to the removal of clay. Ignition increased the solubility of the acid-forming substances. Similar experiments with fuller's earth showed that the acid-forming substances in that material were more ionized than in the soil used, from which it is inferred that the acid-producing substances in soil, as well as those in fuller's earth, are alumino-silicates. The alumino-silicates are produced by the loss of bases during weathering.

- B. D. Wilson—The quantity of sulfur in rain water. *Amer. Soc. Agron. Journ.* 15:453-456. 1923.

In addition to giving a report on the amount of sulfur in rain water, this paper discusses the question of sulfur conservation in two soil types.

- B. D. Wilson—The effect of plants on the concentration of drainage water from the Cornell lysimeters. *Soil science* 16:427-432. 1923.

The concentration of the drainage water from lysimeters under different soil treatments is reported in this paper. Irrespective of the quantity of water from the several tanks, the concentration of that from unplanted soil is always highest, that from the soil planted to a crop rotation is always lowest, and that from tanks which are in grass continuously is intermediate. The concentrations of the percolates were found to be independent of the amount of water leaching through the soil. Since the different soil treatments have resulted in bringing about a condition within the soils which causes them to liberate their soluble material in a more or less characteristic way, it is quite possible that the colloidal material in the soil, and the water film which is in intimate contact with the soil particles, relinquish a rather definite proportional share of their soluble material to that portion of the soil water which is free to move.

- J. K. Wilson—Bacterial symbiosis in plants other than the legumes. *Amer. Soc. Agron. Journ.* 16:373-381. 1924.

This paper is a review of articles written by nine authors who deal with one or more phases of bacteria or fungi and certain plants in possible symbiosis. Such symbiosis, for the most part, existing mainly in those parts of the plants that grow above the ground. From this review one is led to make the following statements: Bacteria may be found not only in the tissues of a great number of plants, but also in the buds, the flowers, and the seeds. In certain cases the bacteria that are found in the seed may pass through the tissue of the growing plantlet and subsequently appear in the leaves and the bloom, and finally enter and remain with the growing seed. This condition may be called hereditary symbiosis. In two families, the *Myrsinaceae* and the *Rubiaceae*, hereditary

symbiosis has been observed, and it is suggested in many others. The bacteria in symbiosis with the Rubiaceae enable the plant to obtain free nitrogen from the air for its own use. These bacteria from plants of the Rubiaceae family, and possibly also from the Myrsinaceae family, when grown under suitable conditions in culture medium, increase the nitrogen content perceptibly. Both Myrsinaceae and Rubiaceae plants when deprived of their bacterial symbiont grow poorly and show nitrogen starvation.

The following papers are ready for publication:

1. H. Panganiban — Factors influencing nitrogen changes in the soil.
2. Pepin — Relation of soil basicity to the growth of legumes.
3. K. Wilson — Growth of bacteria in sterilized soil, both planted and unplanted, when inoculated with pure cultures of certain bacteria capable of producing transformations of nitrogen.
4. E. Winters — Effect of lime on the biological processes in soils.

Animal Husbandry

In the Department of Animal Husbandry, the following manuscript has been accepted for publication as a bulletin of the Experiment Station:

1. W. Harper — Feeding work horses.

Botany

In the Department of Botany, the following papers have been published:

1. C. Auchter — Is there normally a cross transfer of foods, water, and mineral nutrients in woody plants? Univ. Maryland Agr. Exp. Sta. Bul. 257:33-60. 1923.

Experiments were conducted to ascertain whether foods, water, and mineral nutrients which are produced or absorbed on one side of a woody plant are used only on that side, or whether there is an appreciable cross transfer of such materials from one side to the other. The evidence obtained indicated rather clearly that normally the nutrients absorbed by the roots on one side of a tree are mostly carried up to the branches on that side, and that foods made in the leaves on one side are carried down chiefly on that side. It seemed, however, that water was fairly readily transferred from one side to the other.

2. H. Burnham — Supplementary list of the ferns of the Lake George flora, New York. Amer. fern journ. 13:109-113. 1923.

The additional data which have accumulated since the publication of the preliminary list published in 1916 and 1917 are given in this supplementary list.

3. H. Burnham and R. A. Latham — The flora of the town of Southold, Long Island, and Gardiner's Island, New York. Fourth supplementary list. Torreyia 24:22-32. 1924.

This is a record of fungi, flowering plants, and the like, collected during the year 1923.

4. F. Curtis — The effect of ringing a stem on the upward transfer of nitrogen and ash constituents. Amer. journ. bot. 10:361-382. 1923.

The generally accepted hypothesis with regard to the upward movement of foods and nutrients is that these move upward in the xylem with the ascending water. This paper gives data showing that whenever stems are ringed the upward movement of the nitrogen and other nutrients is almost completely stopped. Experiments were performed with different kinds of woody plants and under various conditions. The data offer strong evidence that nutrients move upward primarily in the bark or phloem regions, and not in the wood or xylem, with the ascending water.

5. J. Eames and K. M. Wiegand — Variations in *Trillium cernuum*. Rhodora 25:189-191. 1923.

The forms of this species are discussed, and a new variety, var. *macranthum*, is proposed.

6. M. L. Fernald and K. M. Wiegand — Notes on some plants of the Ontario and St. Lawrence Basins, New York. Rhodora 25:205-214. 1923.

This paper gives a general account of a botanical excursion made by the authors, in 1922, to the east end of Lake Ontario and the adjacent part of the

St. Lawrence Valley. The unusual plants found are listed, with comments and notes.

Lewis Knudson—Further observations on nonsymbiotic germination of orchid seeds. *Bot. gaz.* 77:212-219. 1924.

The new experiments here described lend further support to the hypothesis that the germination of orchid seeds is dependent on an outside source of organic matter.

K. M. Wiegand—Notes on *Triosteum perfoliatum* and related species. *Rhodora* 25:199-203. 1923.

The variations in this species have been a source of great perplexity to investigators. The species is here revised, and most of the forms are made varieties of *T. perfoliatum* rather than separate species.

K. M. Wiegand—Some changes in nomenclature. *Rhodora* 26:1-5. 1924.

In the preparation of the manuscript of the flora of the Cayuga Lake Basin, noted below, a number of changes in the names of the plants listed were found necessary. These are here made, with critical discussions and notes.

The following manuscript has been accepted for publication as a memoir of the Experiment Station:

K. M. Wiegand and A. J. Eames—The flora of the Cayuga Lake Basin.

The following papers are ready for publication:

H. Castle—The anatomy of the flowers of the genus *Saururus*.

H. H. Clum—The effect of transpiration and environmental factors on leaf temperature.

O. F. Curtis—The effect of cutting the xylem, as compared with that of cutting the phloem, on the upward transfer of foods and nutrients.

E. I. Fernald—The inhibition of bud development as correlated with osmotic concentration of cell sap.

M. J. Fisher—The anatomy of the flower of the Salicaceae.

A. L. Grant—Revision of the genus *Mimulus* (Scrophulariaceae).

J. M. Haber—The anatomy and morphology of the flower of *Euphorbia*.

J. E. Knott—Effect of soaking seed, and of the temperature during germination on the subsequent behavior of some vegetable-crop plants.

R. S. Nanz—The influence of hydrogen-ion concentration on the germination of orchid seed.

E. L. Proebsting—The effect of defoliation on cambium growth.

L. W. Sharp—Recent advances in cytology.

L. W. Sharp—The factorial interpretation of sex determination.

G. H. Smith—The anatomy of some ranunculaceous flowers.

B. K. Stewart—The morphology of the flower of *Phryma*.

Dairy Industry

In the Department of Dairy Industry, the following manuscript has been accepted for publication as a memoir of the Experiment Station:

H. A. Ruehe—Effect of the process of manufacture on the germ content of bulk condensed milk.

The following papers are ready for publication:

J. D. Brew and R. C. Fisher—The influence of transportation on the bacteria content and the temperature of market milk.

T. J. McInerney—The limit of error in counting bacteria in milk by means of the direct microscopic method.

A. H. Rishoi—The effect of homogenization on the viscosity and stability of evaporated milk.

J. M. Sherman and H. R. Curran—The germicidal action of milk, and a mode for its measurement.

Entomology

In the Department of Entomology, the following papers have been published:

- O. A. Johannsen — A new chloropid subgenus and species from New York. *Canad. ent.* 56:80. 1924.

In this article is described a new species of fly which has an unusually elongated abdomen, apparently composed of but one segment.

- O. A. Johannsen — A method for the extermination of the round-headed apple-tree borer. *Journ. econ. ent.* 17:383-386. 1924.

A method is here described for the extermination of the round-headed apple-tree borer by means of fumigation with carbon disulfide. Absolute control is obtained with less expenditure of time than by the digging-out process now in use.

- J. G. Needham — Neotropical mayflies. *Bulletin of the Lloyd Library*, 24:1-65. 1924.

This is a monograph which contains an account of one hundred and twenty-seven species of mayflies, thirty-five of them new to science. For most of the genera, descriptions and figures of immature stages are given.

- J. G. Needham — Entomological uses for yucca stems. *Ent. News* 35:19-21. 1924.

This is a brief paper on methods.

- J. G. Needham — Observations on the life of the ponds at the head of Laguna Canon. *Pomona journ. zool. and ent.* 16:123-134. 1923.

This paper presents an ecological sketch of a peculiar and limited fauna and flora in shallow ponds in southern California, studied by the writer during his year as exchange professor at Pomona College.

- J. G. Needham — Separate brief biological articles in the *Lincoln Library of Essential Information*. 1924.

- L. P. Wehrle — Notes on the pear midge (*Contarinia pyrivora*). *Journ. econ. ent.* 17:411-414. 1924.

Observations on the habits of the larva of the pear midge are contained in this paper, with additional information on its life history.

- L. P. Wehrle — The clover-seed caterpillar. *Cornell Univ. Agr. Exp. Sta. Bul.* 428:1-40. 1924.

The following manuscripts have been accepted for publication as memoirs of the Experiment Station:

- J. L. Buys — The Cicadellidae of the vicinity of Ithaca, New York, with special reference to the structure of the gonapophyses.

- S. W. Frost — A study of the leaf-mining Diptera of North America.

- H. C. Hockett — A systematic study of the Anthomyiinae of New York, with especial reference to the male and female genitalia.

- A. E. Lundie — A biological study of *Aphelinus mali* Hald., a parasite of the woolly apple aphid, *Eriosoma lanigera* Hausm.

The following papers are ready for publication:

- V. R. Haber — The blood of the cockroach.

- O. A. Johannsen — Eye structure in normal and eye-mutant *Drosophila*s.

- Mrs. Q. C. Kessel — The Strebliidae.

- L. P. Wehrle — A study of the segmentation of the antennae of the clover-flower midge (*Dasyneura leguminicola* Lintner).

- L. P. Wehrle and P. S. Welch — The occurrence of mites in the tracheal system of certain grasshoppers.

Forestry

In the Department of Forestry, the following paper has been published:

- A. B. Recknagel — Growth of white spruce in the Adirondacks. *Journ. forestry* 21:794-795. 1923.

This article deals with the results of a study of the current annual increment of white spruce (*Picea glauca*) in the Adirondacks. More than eight hundred measurements were made, and the results show a more rapid growth, in volume and height, of white spruce as compared with red spruce. The study is important as pointing to the suitability of this species for management in producing pulpwood.

Plant Breeding

In the Department of Plant Breeding, the following papers have been published:

- A. F. Barney — The inheritance of smut resistance in crosses of certain varieties of oats. *Amer. Soc. Agron. Journ.* 16:283-291. 1924.

This paper is a preliminary report dealing with the smut resistance of a number of oat crosses. The varieties Black Mesdag, Burt, and Fulghum were found to be resistant, Gold Rain intermediate, and Swedish Select and Turkish Rust-proof highly susceptible. The studies indicate that resistance is dominant and that there are different factors concerned in the inheritance. So far as the studies reported are concerned, ratios of 3:1, 15:1, and 63:1 were obtained. It is pointed out that it is possible to obtain true-breeding smut-resistant strains of oats.

- R. A. Emerson — Control of flowering in teosinte. *Journ. hered.* 15:41-48. 1924.

Experiments were conducted to force teosinte into flower in midsummer for hybridization with maize. Plants were grown in the greenhouse for a month after germination, and then one lot was exposed to a ten-hour day, one lot was left in the greenhouse, and one lot was kept out of doors and subjected to short-day treatment at various ages and for different lengths of time. The results showed that the plants given only ten hours of daylight blossomed earlier than those exposed to a full-length day, and, in general, the later the short-day period was begun, the later the plants flowered.

- R. A. Emerson — A genetic view of sex expression in the flowering plants. *Science* 59:176-182. 1924.

Sex characters of flowering plants are to be explained on the basis of genetic factors associated with the chromosomes. The behavior of such factors is in no way unlike that of the genes for vegetative characters. In dioecious forms, the factors both for maleness and femaleness are present both in the male and in the female plants, and the sharp differentiation of sex is due to the strong tendency of one set of factors to throw the balance toward the sex condition found. Hermaphroditism results from a delicate balance of the sex factors and a consequent tendency of both sets to come into expression. In many dioecious plants, and in some animals, the balance of these two sets of genes is so delicate that it may go either way, depending on the surrounding conditions. Studies of the sex condition in corn bear out these conclusions.

- R. A. Emerson — Aberrant endosperm development as a means of distinguishing linkage groups in maize. *Amer. nat.* 58:272-277. 1924.

In an earlier paper (*Amer. journ. bot.* 8:411-424, 1921) the writer showed that in the case of corn seeds heterozygous for the linked genes *Cc* and *Wx wx*, white patches on the seeds were underlain by waxy endosperm and colored patches were underlain by starchy endosperm; that is, the parental combinations of characters were exhibited. This relation did not hold for genes that were not linked. In the present paper, additional data are presented to show a similar behavior on the part of other genes known to be linked with each other. Further data are offered to show that there is not this regularity of behavior in the case of non-linked genes. A study is made of all the aleurone factors that can be studied by this method, and conclusions are drawn regarding linkage groups.

- A. C. Fraser — Breeding hardy roses for northeastern America. *Amer. rose annual* 9:33-36. 1924.

A statement of the problems to be solved in breeding roses for New York State is here presented, and a brief account is given of some of the methods that are being used.

- A. C. Fraser — Heritable characters of maize. XVII. Intensified red and purple aleurone color. *Journ. hered.* 15:119-123. 1924.

Studies of some of the very intensely colored kernels of maize have led to the conclusion that these are produced by the combined action of a recessive factor, designated by *in*, and certain other aleurone color factors. The *in* factor with *A C R pr i* produces an intensified red which is nearly black. With *A C R Pr i*, the *in* factor causes the development of a jet-black color, instead of purple. Genetical tests showed that the same factor was responsible for the intensification of the red and the purple.

- H. H. Love — A modification of Student's table for use in interpreting experimental results. *Amer. Soc. Agron. Journ.* 16:68-73. 1924.

The probability values of Student's table, as published in his paper, are translated into odds, and the table is expanded somewhat. With this table one may read odds directly when the Z of Student has been calculated.

- H. H. Love and A. M. Brunson — Student's method for interpreting paired experiments. *Amer. Soc. Agron. Journ.* 16:60-68. 1924.

The method given by Student in *Biometrika* (volume 6, pages 1-25) is discussed and the details of the calculations are given. Its application to the results of different years, or of different trials in one year, is shown. How it is used in the interpretation of results also is made clear.

- H. H. Love and W. T. Craig — Methods now in use in cereal breeding and testing at the Cornell Agricultural Experiment Station. *Amer. Soc. Agron. Journ.* 16:109-127. 1924.

In this paper the methods used for the improvement and testing of small grains are described in detail, including the methods for sowing, harvesting, threshing, labeling, and the like. The methods for calculating yields and interpreting check plats are given also.

- C. H. Myers — Some comments on selection with special reference to potatoes. *Potato news bul.* 1:107-112. 1924.

This paper presents a discussion of the modern concept of selection, and its application in the hill-unit selection of potatoes and in bud selection in general. Attention is called to conflicting opinions concerning the efficacy of hill selection, and three reasons are given for these. They are, first, the effect of diseases; second, a misconception of the function of selection; third, inadequate methods of testing. In connection with methods of testing, recommendations are made, based on experimental data, to use at least five replications of twenty-five-hill plots.

- R. G. Wiggans — Studies of various factors influencing the yield and the duration of life of meadow and pasture plants. *Cornell Univ. Agr. Exp. Sta. Bul.* 424:1-24. 1923.

Experimental results for from three to twelve years are reported, for several factors influencing the yield and the duration of life of the common meadow and pasture plants. The effect of cutting timothy at different stages of development showed that the life of the meadow is increased, and the quality of the hay made better, by early cuttings, chiefly because of the resulting control of weeds, particularly daisies. Heavy applications of manure and fertilizer increased the yield and lengthened the life of timothy, redtop, and meadow-fescue sods, but even under this treatment the limit was soon reached where active competition of weeds had largely exterminated the desirable vegetation. Various rates of seeding and combinations of grasses and clovers for meadows showed: (1) A rather wide range in the rate of seeding had little effect; fifteen pounds per acre was probably abundant under favorable conditions, and any seed in excess of twenty pounds per acre was wasted. (2) Meadow grasses should practically always be seeded in combination with clover, as a heavier production and a greater length of life of the meadow is thus secured. (3) Redtop should generally be excluded from meadow mixtures, since it tends to dominate the vegetation wherever it obtains a foothold. It can be used to advantage, however, where conditions are unsuited to timothy.

Under meadow management the life of orchard grass, tall oat grass, and blue grass was more or less indefinite, while the other common grasses were soon exterminated by competition with blue grass and weeds. Only blue grass and orchard grass survived under pasture management. Blue grass was the only common grass that gave as great a yield under pasture as under meadow management. The coarser grasses gave from 50 to 70 per cent as much under pasture as under meadow management. A study of the period within the season of greatest production showed considerable variation between different grasses, indicating the desirability of a mixture of grasses for pasture purposes.

- R. G. Wiggans — Relative adaptability of home-grown and foreign-grown red clover seed. *Amer. Soc. Agron. Journ.* 15:500-507. 1923.

The results of a second trial of foreign as compared with domestic red-clover seed for hay production under New York conditions are reported. Ten foreign and three native lots of seeds were tested in triplicate plots. Only one foreign source, Bohemia, gave results comparable with those from the native seed. The other foreign sources, Italy, Chile, Hungary, France, and North Germany, gave from 3 to 73 per cent as much dry-weight production of clover as did the Michigan-grown seed. The results, together with the results of the previous test, seem to justify the conclusion that home-grown seed will give better yields, on the average, than foreign-grown seed; that red-clover seed should be produced for several generations under climatic conditions at least as severe as those where the seed are to be used; and that, if foreign seed must be used, care should be taken to secure seed produced in continental European countries.

The following manuscripts have been accepted for publication as memoirs of the Experiment Station:

- M. Demerec — Genetic relations of five factor pairs for virescent seedlings in maize.
 Paul Kvakan — The inheritance of brown aleurone in maize.
 Helen Trajkovich — The inheritance of a xantha seedling character in maize.

The following manuscript has been accepted for publication as a bulletin of the Experiment Station:

- R. G. Wiggans — Experiments in crop rotation and fertilization.

The following papers have been accepted for publication elsewhere and are in press:

- E. G. Anderson — Pericarp studies in maize. II. The allelomorphism of a series of factors for pericarp color.
 H. H. Love — The contribution of genetics to the field of crop production.
 H. H. Love and W. T. Craig — The genetic relation between the *Triticum dicoccum* dicoccoids and a similar morphological type produced synthetically.
 H. H. Love and W. T. Craig — The inheritance of velvet node in a cross between two varieties of wheat.
 C. H. Myers — Cooperation between seedsmen and agricultural experiment stations in the production and distribution of better seed.

The following papers are ready for publication:

- H. H. Love — The rôle of statistics in agronomic experimentation.
 H. H. Love — The rôle of biometrics in research in home economics.

Plant Pathology

In the Department of Plant Pathology, the following papers have been published:

- F. M. Blodgett — Time-temperature curves for killing potato tubers by heat treatments. *Phytopathology* 13: 465-475. 1923.

Potato tubers of the Rural type affected with leaf roll, and Bliss potatoes affected with mosaic, were subjected to hot-water treatments through a range of temperatures from 35° to 80° C. At each temperature used, treatments were made for periods of time ranging from short intervals up to periods long enough to kill the potatoes, in order to determine the time-temperature curve for the killing of potatoes, the virus of mosaic, and the virus of leaf roll. In all cases the potatoes remained diseased as long as they remained alive. The time-temperature curve for practically complete killing of the potatoes may be represented by the equation

$$\log t + 0.09552x = 6.5896,$$

in which t is the time in minutes and x is the temperature in degrees centigrade. Black-heart resulted at all temperatures between 40° and 100° C. within about the time range necessary for killing potatoes. Hot-air treatments were

tried with white-sprout potatoes affected with mosaic. All potatoes surviving the treatment developed mosaic. The time-temperature curve for killing potatoes in a well-ventilated hot-air oven may be represented by the equation

$$(t-8.4255)(x-34.5)^3 = 1,057,500.$$

- W. H. Burkholder—The gamma strain of *Colletotrichum lindemuthianum* (Sacc. et Magn.) B. et C. *Phytopathology* 13:316-323. 1923.

A third race of *Colletotrichum lindemuthianum*, the cause of anthracnose in beans, is reported, and the varietal susceptibility of more than one hundred varieties and strains of the bean (*Phaseolus vulgaris* L.) to the new form is given. Breeding experiments demonstrated that resistance to this fungus is governed by a single factor.

- W. H. Burkholder—Varietal susceptibility among beans to the bacterial blight. *Phytopathology* 14:1-7. 1924.

The varietal susceptibility to the bacterial blight of approximately one hundred and seventy-five varieties and strains of the bean, *Phaseolus vulgaris* L., and related species, is recorded from experiments extending over a period of three years.

- W. H. Burkholder—The effect of varying soil moistures on healthy bean plants and on those infected by a root parasite. *Ecology* 5:179-187. 1924.

The experiments reported show that the bean plant is very sensitive to changing moisture conditions in the soil. This sensitiveness is increased if the plant is infected by the root pathogene, *Fusarium martii phaseoli* Burk. The optimum soil for healthy plants is about one-half the water-holding capacity of the soil (Hilgard 1-centimeter cup). Plants infected by the root pathogene show a greater reduction in yield in dry soils than in medium wet and in wet soils. Healthy plants grown in dry soils respond freely when additional moisture is added at blossoming time. This, however, is not the case with diseased plants.

- H. W. Dye and A. G. Newhall—The control of bacterial blight of celery by spraying and dusting. *Cornell Univ. Agr. Exp. Sta. Bul.* 429:1-38. 1924.

- H. M. Fitzpatrick—Generic concepts in the Pythiaceae and Blastocladiaceae. *Mycologia* 15:166-173. 1923.

Several imperfectly understood genera of the higher Phycomycetes are here discussed. The genera *Pythium* and *Phytophthora* are shown to be so closely related as to be indistinguishable. The paper is regarded as opening several interesting fields for research in these highly important economic groups. The genera *Allomyces* and *Nematosporangium* are elucidated.

- H. M. Fitzpatrick—The genus *Fracchiacea*. *Mycologia* 16:101-114. 1924.

This is a monograph of the world's species of this genus which previously had been completely misunderstood. It should be incorporated in the *Nitschkieae*.

- E. F. Guba—*Phyllosticta* leaf spot, fruit blotch and canker of the apple; its etiology and control. *Phytopathology* 14:234-237. 1924.

The relationship of *Phyllosticta solitaria* E. and E., the causal organism of apple blotch, to the genus *Guignardia* is discussed. The author discusses also the life history of the fungus, and control measures.

- E. F. Guba and P. A. Young—Check list of important references dealing with the taxonomy of fungi. *Amer. Micros. Soc. Trans.* 43:17-67. 1924.

This paper constitutes a guide to the literature for the identification of the fungi, comprising citations to all published monographs and revisions of classifications since 1900. The citations are arranged according to the natural classifications of the fungi.

- R. S. Kirby—Comparative efficiency of formaldehyde, copper-carbonate dust and sulfur dust in controlling smuts in hulled oats. (Abstract.) *Phytopathology* 14:42-43. 1924.

Data were obtained from nineteen experiments in twelve counties in New York in 1923. Each experiment, consisting of one check and from two to five treated plots, each of which averaged one-eighth acre in size, was planted with naturally inoculated oats from different sources. It was shown that (1) formaldehyde is not with certainty a better treatment than 4 ounces of CuCO_3 , (2) formaldehyde is better than any other treatment excepting 4 ounces of CuCO_3 , and (3) 4 ounces of CuCO_3 is better than 2 ounces of CuCO_3 or the sulfur treatments.

- H. E. Thomas—Tobacco wildfire and tobacco seed treatment. *Phytopathology* 14:181-187. 1924.

The results of experiments on the overwintering of the wildfire organism and on various methods of treating and handling tobacco seed, are here presented.

- D. S. Welch—A sclerotial disease of cultivated *Delphinium* (Abstract.) *Phytopathology* 14:31. 1924.

Sclerotium delphinii n. sp. is shown to be pathogenic on *Delphinium*, and the symptoms of the disease are briefly described. Diseased specimens were obtained from New York, New Jersey, Pennsylvania, and Indiana.

- H. H. Whetzel—Report of the plant pathologist for the period January 1st to May 31st, 1922. Bermuda Board and Dept. Agr. Report 1922:28-32. 1923.

A report of the activities of the plant pathologist is given, with recommendations based on a survey of the diseases and pests during the period covered.

- H. H. Whetzel and J. M. Arthur—The grey bulb-rot of tulips. (Abstract.) *Phytopathology* 14:30-31. 1924.

This disease, long known in Holland and Germany as the sclerotium disease of tulips, is here reported apparently for the first time from America. The causal organism, known formerly as *Sclerotium tuliparum* Klebahn, is transferred on morphological grounds to the genus *Rhizoctonia* and becomes *R. tuliparum* (Klebahn) n. comb. Soil-disinfection experiments indicate that the fungus may be effectively eradicated from infested soil by the application of formaldehyde solution at the rate of 1 pound (40 per cent) formalin to 5 square feet of soil surface.

The following manuscripts have been accepted for publication elsewhere and are in press:

- W. H. Burkholder—Variations in a member of the genus *Fusarium* grown through a period of five years in culture.
E. F. Guba—*Phyllosticta* leaf spot, fruit blotch, and canker of the apple; its etiology and control.

The following papers are ready for publication:

- O. C. Boyd—Investigations on the relative efficiency of some copper fungicides in the control of potato diseases and insect pests.
Charles Chupp—Manual of vegetable diseases.
L. O. Gratz—Wire stem of cabbage.
E. F. Guba—Pathologic histology of apple blotch.
E. F. Guba—The genus *Pestalotia*. A preliminary consideration of classification.
R. S. Kirby—The take-all disease of cereals and grasses caused by *Ophiobolus cariceti* (B. and Br.) Sacc.

Pomology

In the Department of Pomology, the following papers have been published:

- A. J. Heinicke—The set of apples as affected by some treatments given shortly before and after the flowers open. *Amer. Soc. Hort. Sci. Proc.* 20:19-25. 1923.

In experiments involving trees of varying vigor, it has not been found possible to reduce the set of flowers already formed, either by ringing in spring just before the flowers open or by the application of liberal amounts of sodium nitrate. On the other hand, both of these treatments seem to have a tendency to increase the set of fruits in flower-bearing trees of either low or high vigor. Cutting the sapwood, however, seems always to reduce the set, and may even counteract the favorable influences of ringing or nitrate application. The beneficial influence on the set resulting from ringing, as well as that which results from the application of nitrogen, is believed to be traceable to the effect of these treatments on the water-attracting and moisture-holding capacity, or on the water requirements, of the tissue. While the emphasis is thus placed on the importance of sustained turgidity during the early critical stages of fruit development, this does not imply that such development could proceed without an adequate

supply of growth-producing substances. Nitrogen and carbohydrates apparently may be present in any proportions relative to each other that it is possible to bring about early in spring, during the time when abscission usually occurs in trees that produce a satisfactory number of perfectly formed flowers.

- A. J. Heinicke — Catalase activity in dormant apple twigs: its relation to the condition of the tissue, respiration, and other factors. Cornell Univ. Agr. Exp. Sta. Memoir 74:1-33. 1924.

A method of preparing apple-bark tissue for catalase determination is described in this memoir, and the details of the determination are given, with evidence regarding their dependability and with a discussion of the factors influencing the rate of catalysis. The mathematical significance of small differences in the results can be established by the method used. The catalase activity of various woody tissues, such as xylem, inner and outer bark, buds, bud shoulders, callus tissue, and the apical and basal parts of a twig, is shown, also the influence of various cultural methods, such as sod, ringing, and application of nitrate fertilizers. In general the data seem to afford a basis for the suggestion that the presence of growth-producing substances favors catalase activity, while substances tending to inhibit vegetative activity have a retarding influence on the decomposition of hydrogen peroxide by bark tissue. It is recognized that the catalytic power of the preparation is influenced by many physical and biochemical factors, so that the method followed in this study does not exactly determine the amount of catalase present in the tissue. However, it is believed that this does not seriously detract from the usefulness of the catalase test as an indicator of the physiological responses of apple-tree tissues to cultural treatments or conditions. Data regarding the carbon-dioxide production by twigs from trees receiving different treatments indicate that there is no consistent relation between respiratory intensity and catalase activity. This fact, however, is not taken to indicate that catalase activity is therefore without metabolic significance.

- L. H. MacDaniels — Cross pollination between the Reine Claude and Burbank plums. Amer. Soc. Hort. Sci. Proc. 20:123-127. 1923.

This paper gives an account of an experiment in which plum trees of the Burbank (*Prunus triflora*) and Reine Claude (*Prunus domestica*) varieties were inclosed in an insect-proof cage with a hive of bees to insure pollination. A considerable crop of large-sized plums matured on both trees, showing that the two varieties are interfertile. The seeds of neither variety germinated, indicating that they are intersterile in the true sense. These and other observations suggest that it might be possible to grow the Burbank plum with some variety of *domestica* plum and get a satisfactory crop of the Burbank without the necessity of thinning the fruit—a practice which at present is costly.

The following manuscript has been accepted for publication as a memoir of the Experiment Station:

- D. B. Carrick—Some effects of freezing on mature fruits of the apple.

The following papers are ready for publication:

- A. J. Heinicke and B. D. Wilson — The toxicity of sod to apple trees.
T. L. Lyon, A. J. Heinicke, and B. D. Wilson — The relation of soil moisture and nitrates to the effect of sod on plum and cherry trees.

Rural Education

In the Department of Rural Education, the following paper is ready for publication:

- E. N. Ferris — The rural high school: its organization and curriculums.

Rural Social Organization

In the Department of Rural Social Organization, the following papers have been published:

- E. L. Kirkpatrick — The standard of life in a typical section of diversified farming. Cornell Univ. Agri. Exp. Sta. Bul. 423:1-133. 1923.

This bulletin gives the results of a study of 402 farm families in Livingston County living on farms of which a farm-management survey had been made in 1919. An attempt was made to find a measure of the standard of life, not only in terms of income and expenditure but through the use of time in the satisfaction of wants for things both material and spiritual; also, to determine objective evidences of what is commonly called the culture of the rural family.

Dwight Sanderson and W. S. Thompson—The social areas of Otsego County. Cornell Univ. Agr. Exp. Sta. Bul. 422:1-40. 1923.

Both the neighborhoods and the communities of the county were mapped in the course of this study, and descriptions of typical neighborhoods are given in the bulletin. The practical application of the methods involved in such a study would be evident in case a rural-education bill should be passed.

Vegetable Gardening

In the Department of Vegetable Gardening, the following papers have been published:

E. V. Hardenburg—Ecological factors affecting tuber-set in potatoes. Potato Assoc. America. Proc. 10:165-172. 1923.

This paper presents a tentative report on investigations in progress at Cornell University, concerning the influence of such factors as air temperature, soil temperature, soil moisture, soil type, date of planting, and date of harvest, on tuber set and on yield of potatoes. The two standard types of potatoes in New York, Green Mountain and Rural, were used. The first three factors were studied under greenhouse conditions, beginning in February, 1923. The first year's results indicate that air temperature and soil moisture are very influential on both tuber set and yield, high temperature giving a much greater set but a much lower yield than low temperature. Under cool temperatures, the tuber set was inversely proportional to the soil moisture while the yield was directly proportional. Under warm temperatures, both the tuber set and the yield were directly proportional to the soil moisture. Soil temperature was not sufficiently varied by the moisture treatments to lend any apparent influence. The study of soil-type influences was begun in May, 1923, at Ithaca on sandy loam and silt loam soils, and in Wayne County on muck and stony loam soils. The highest tuber set and yield were obtained in the sandy loam at Ithaca and in the muck in Wayne County, the results thus being in favor of the lighter soils. The study of influence of date of planting and date of harvest was begun at Ithaca in 1922, comparing May 31, June 20, and July 10 as dates of planting, and August 25, September 15, and October 6 as dates of harvest. The results indicate that approximately the maximum tuber set is obtained as early as August, and that neither maximum set nor maximum yield can be expected in potatoes planted later than May 31.

W. E. Loomis—Some relations of hardening to transplanting. Amer. Soc. Hort. Sci. Proc. 20:206-215. 1923.

Hardened plants, which transpired slightly less than did tender plants in the checks, were found to lose water more rapidly when plants of both lots were transplanted. The increased water loss was correlated with an increased rate of new root formation. Apparently root replacement was hastened by the carbohydrate reserves accumulated during hardening. It is shown that these reserves accumulate very rapidly, and that the maximum benefit can probably be secured from a few days of hardening treatment.

H. W. Schneck—Vegetable gardening teaching in agricultural colleges. Amer. Soc. Hort. Sci. Proc. 20:81-87. 1923.

A study of the place which the subject of vegetable gardening occupies in the teaching program of agricultural colleges of the United States revealed only one institution that does not offer any vegetable-gardening courses. Fifteen institutions offer one course, fourteen offer two courses, four offer three courses, four offer four courses, seven offer five courses, and three offer more than five courses. A course in general or elementary vegetable gardening is offered by forty-seven colleges, one in advanced or commercial vegetable gardening by

thirty-two colleges, one in vegetable forcing by eighteen colleges, and one in systematic gardening by twelve colleges. All of these courses are offered by the Department of Vegetable Gardening at Cornell University to regular four-years students, and similar courses are offered in the twelve-weeks winter term and in the six-weeks summer school. Only four of the forty-seven institutions referred to above require courses in fundamental sciences as prerequisite to their first course in vegetable gardening. Prior to taking courses in vegetable gardening at Cornell, four-years students are required to get a broad foundation in fundamental sciences. Although vegetable gardening has made immense forward strides in colleges as far as the number and the organization of courses are concerned, very few students are interested in the subject. The average registration in the elementary course where it is not required is only seventeen students, and in only two colleges is it more than twenty. The average registration in advanced courses is only six students. A study was made of the causes for this low registration and lack of interest in the subject of vegetable gardening on the part of students. Most vegetable-gardening teachers feel that what is mainly needed, in order to attract more students, is improvement in the teaching of the subject. This can be secured in the following ways: first, and most important, there should be more fundamental research in vegetable gardening, and greater use by the teacher of the horticultural principles that have been discovered; secondly, more teachers are needed who have had thorough training in the fundamental sciences underlying vegetable gardening; thirdly, more training in psychology and teaching methods is needed by vegetable-gardening teachers; fourthly, more equipment should be provided, in the form of greenhouses, hotbeds, coldframes, and land; fifthly, more time should be devoted to the inspection of commercial market-garden and truck farms, and the students should be required to analyze the causes of success or failure of different growers.

- H. W. Schneck—Pollination studies with greenhouse tomatoes. Amer. Soc. Hort. Sci. Proc. 20:198-206. 1923.

The results of a study of the pollination of greenhouse tomatoes indicate that the method of applying the pollen has a pronounced effect on the set of fruit, earliness, and size. All of these were increased by emasculation and the watch-glass method as compared to other methods. Especially as compared with undisturbed plants, much less misshapen fruit, and a larger proportion of first-grade fruit, is produced by hand methods of pollination, although the proportion of blossom-end rot is slightly increased, probably due to increased yields. The cost of pollination with hand methods ranges from 7 to 10 cents a plant as compared to 2 cents a plant with jarring, but the yield per plant is increased over that of undisturbed plants by 1.5 pounds with jarred plants and by 2.3 pounds with hand methods. The difference in net returns between undisturbed plants and plants pollinated by hand methods was approximately 120 per cent for the first four weeks of harvesting. The experiments show that careful hand pollination of blossoms is a very important and economical factor in the successful production of greenhouse tomatoes, and that careful hand pollination is much more important as a means of increasing the returns with the first blossom clusters that develop on tomato plants than with those that form later.

- H. C. Thompson—Factors influencing early development of seed stalk of celery. Amer. Soc. Hort. Sci. Proc. 20:219-224. 1923.

The results of experiments conducted at Ithaca during the past five years indicate that early sowing of the seed is one of the main factors causing the development of the seed stalk of celery. Contrary to the common belief, checking the growth of the plants while small, and before they are set out, by freezing, drying out, and crowding in the flat, materially delays the development of the seed stalk. However, keeping the plants at relatively low temperatures for two or three weeks prior to setting out seems to hasten development of the seed stalk, but in this case growth is not materially checked. Plants from seed sown on December 10 and January 10 have developed seed stalks in May and June regardless of the treatment given prior to setting in the field; while those grown from seed sown the latter part of February have not developed seed stalks during the summer, regardless of the treatment given. This is evidence

that the length of day is a factor to be considered, since full-grown plants set in the greenhouse in the fall have not developed seed stalks until the following spring, when the period of daylight was at least twelve hours. In this case the plants were full-grown in August and September, whereas the plants from seed sown on December 10 and January 10 were less than one-fourth grown when seed stalks began to develop in May and June.

Paul Work — Nitrate of soda in the nutrition of the tomato. Cornell Univ. Agr. Exp. Sta. Memoir 75: 1-86. 1924.

Tomato plants were grown in the greenhouse, in boxes of quartz sand, under conditions such that the amount of nitrate of soda applied to the soil varied through definite series, and, as far as possible, other factors for growth were provided in uniform and favorable excess. The plant performance was recorded in great detail, quantitative measures being used as far as possible, and the attempt was made by means of chemical analysis to throw some light on the conditions existing within the plants that had been subjected to the various treatments. High vegetative growth and fruitfulness were associated with nitrate contents in leaves (green-weight basis) ranging from 0.3 to 0.4 per cent. Higher nitrate contents were not found, and lower contents were thought to represent stages in nitrogen exhaustion since optimum contents were maintained for a short time even with very light applications. The injurious effect of heavy applications of nitrate of soda is apparently due to its effect as a factor in the environment of the plant reducing the availability of the water supply, rather than to its effect as an internal poison. There is no apparent relation between the amount of nitrate applied to the soil and the concentration of total carbohydrates in the plants, save that the carbohydrate content is high in plants whose growth has been stopped by a lack of available nitrogen. Carbohydrate content in leaves showed a range from about 1 to about 6 per cent, green-weight basis. The highest content was in plants suffering from nitrogen deficit. Vigorously vegetative plants ranged from 0.92 to 3.66 per cent of carbohydrates in the leaves, and all categories of vegetation, fruitfulness, and nitrogen content were included within this range. The concentration of carbohydrates in a plant is the resultant of the balance between the processes of manufacture and the many processes of use. The data for these experiments suggest that so long as the rate of manufacture is sufficient to meet current needs, the amount of carbohydrate present does not condition the processes of vegetation and fruition.

The following paper is ready for publication:

W. E. Loomis — Studies in the transplanting of vegetable plants.

THE STATE EXTENSION SERVICE

One of the developments most to be desired, relative to the extension service of the College, and one that is gradually but surely becoming evident, is widespread public recognition of its educational function. Such recognition is indicated in a clearer discrimination between what, on the one hand, is educational, to be supported principally by public funds, and what, on the other hand, is service, to be paid for mainly by those directly benefited. Both fields are growing in public favor.

There is a growing conviction that the development of the educational program, and participation in its benefits, should not be contingent upon membership in some association. All should have the privilege of participating, and all should help pay for the benefits. Reflecting this sentiment, the State Legislature and the county boards of supervisors, with little urging and in spite of insistent demands for retrenchment, each year are making the necessary appropriations for the support of this work, and giving it the needed legal status and direction. Capable men and women are more and more taking part in the definite formulation of edu-

cational community and county programs. More of them are becoming teachers through the local leadership plan. On the part of the college extension staff and the county workers, efforts are being made to increase the educational value of the work through better organized supervisory programs, questionnaires to learn the needs of rural people, surveys and county analyses to learn what agencies and methods are most productive of good, and attendance at conferences and summer schools for their own professional improvement.

The service features of the extension work are based on what the term *service* implies — mainly a solving of the farmer's problems, for which he should pay the cost but which must have sufficient educative value to warrant the College in giving it supervision. Such are the spray information service, the inspection of potatoes, cereals, and poultry for certification, and the culling of poultry after the passing of the demonstration stage. It is noteworthy that in recent years there have grown up state associations of seed-potato growers, poultry producers, and growers of purebred seeds, which pay the cost of inspection and assume all the responsibilities of certification but employ inspectors approved by the College. Other cases in point are the employment of supervisors by dairy-improvement associations and the employment of poultry cullers by groups of farmers.

Administration

There has been no essentially new development in the extension work, but there has been gratifying progress in all of the features mentioned in the report for 1923 — in efforts for economic production, the rapid development of public sentiment in support of the forestry program, the eradication of bovine tuberculosis, the use of better seeds and breeding stock, and the widespread adoption and use of the local-leader method in developing and carrying out extension programs. There has also been a wholesome development of the program in rural social organization.

Farmers' Week. With good weather and open roads, the seventeenth annual Farmers' Week, held February 11 to 16, 1924, drew a record attendance of 3551 as compared with the record attendance of 3116 in 1921 and the smaller attendance of 3034 last year. Visitors came from 56 counties in New York, from 23 other States and the District of Columbia, and from Canada. There were 1432 persons registered from Tompkins County, 188 from Seneca County, 164 from Cayuga County, 134 from Tioga County, 112 from Schuyler County, and 107 from Cortland County. The largest single group was composed of 1122 farmers, and the second largest group of 463 housewives. There were 156 teachers and school superintendents, and 127 extension workers, farm and home bureau managers, and officials of farmers' organizations. It is a matter of interest that 268 farmers and 197 housewives came this year for the first time, showing that Farmers' Week is making new contacts from year to year and that its field of usefulness is constantly broadening. Of the 600 former students registered, 262 were regular four-years students and 338 were short-course and special students.

Junior Field Days. The third annual Junior Extension Field Days, arranged primarily for junior extension or club workers, were held on

June 25, 26, and 27. A total of 1001 persons were in attendance, representing 27 counties. Of this number 564 were girls and young women, and 437 were boys and young men. Attendance at this event has increased rapidly, there having been 161 persons present in 1922, 558 in 1923, and 1001 in 1924. The program was arranged to include features that were: (1) educational—demonstrations and campus tours; (2) recreational—games and athletics; and (3) inspirational—lectures, music, and ceremonials.

Indian extension. The first Indian farmers' schools were held on the reservations, with 16 sessions, an average attendance of 16 to a session, and a total attendance of 470. These schools were held under the direction of local Cornell reservation boards and in cooperation with the county agents. They were a distinct success. Five reservations had eleven demonstration plots, and two carried on jointly community seed plots. Forty-seven demonstration meetings were held on the reservations.

Nine Indian students attended winter courses at Cornell. The returned short-course students are earning the confidence of their people on the reservations, and of neighboring whites. Three are now in the organized councils of their people.

The Cornell Indian reservation boards held several meetings at Ithaca during Farmers' Week. They had a conference with the State Commissioner of Education, at which a satisfactory understanding was reached on the question of elementary Indian education on the reservations.

The first Indian farmers' automobile tour was run to the State Experiment Station at Geneva and the College at Ithaca, on June 26 to 29. There were ten well-filled cars in the tour of the college farms and campus.

The College exhibited at the Six Nations' Fair on the Cattaraugus reservation, assisted in establishing a fair on the St. Regis reservation and made an exhibit there, and assisted three Indian reservation boards at three county fairs. Assistance was given also to five other state agencies doing Indian work. Outlines for 11 pageants for county and community fairs were written, 280 conferences were attended, about 200 days were spent in the field, and about 90 lectures were given with an attendance of more than 18,000 persons.

Loan of lantern slides. On November 1, 1923, a new nine-page announcement of the augmented loan collection of lantern slides was mailed to all field agents, project leaders, high-school teachers, and former borrowers. During the nine months immediately following, 520 series of lantern slides were loaned and 373 reports were received, indicating 619 showings before a total attendance of 26,482. The office now has 60 series of slides, 29 of which are held in duplicate, making a total of 343 slides in the loan collection. Forty-nine of the series are accompanied by supplementary lecture notes prepared by specialists. Judging from its use by high-school teachers, grange lecturers, and county agents, the service is proving a helpful supplement to the specialists' teaching contacts.

Serving as the state clearing house for all federal motion-picture films, the College has approved the applications for 225 loans of films distributed by the United States Department of Agriculture.

Research in extension methods. Plans were made, during the year, to begin the study of the effectiveness of different methods and agencies employed in extension work, and Professor D. J. Crosby was assigned to this study. The first project undertaken was an extension survey, in cooperation with the Extension Service of the United States Department of Agriculture, of all farms in two adjacent townships in Chenango County. This survey, made in October, 1923, gave promise of such valuable results that plans were at once begun to conduct similar surveys in two other counties in the spring of 1924. These plans have been carried out.

The areas to be surveyed were selected with the consent and approval of the local county extension agents and their farm bureau executive committees, the selection being based on (1) the existence in the counties of organized extension work, with agents, in agriculture, home economics, and junior projects; (2) the geological location and the topography of the areas; and (3) the types of agriculture represented.

Columbus and Sherburne Townships, in Chenango County, are located in the east-central part of the State. Of the farms 77 per cent are hill farms, and of the roads 65 per cent are unimproved. The chief sources of income are from dairy products, potatoes, and cabbage.

Brockport and Spencerport communities, in Monroe County, are in the west-central part of the State. The surface is slightly rolling, and about 85 per cent of the roads are improved. The agriculture is highly diversified. Fruit is the chief product, but canning crops, potatoes, grain, hay, and winter-fed lambs and cattle, are important sources of income.

Cape Vincent and Lyme Townships, in Jefferson County, represent the north country. The highways are about 50 per cent improved, and the surface, while in part slightly rolling, would generally be called level. Hay, small grains (mostly oats and barley), and dairy products, are the chief sources of income.

The surveys were made under the direction of M. C. Wilson, of the United States Extension Service, and Professor D. J. Crosby, of the College. A total of 1235 farm and home records were taken, 335 in Chenango County, 517 in Monroe County, and 383 in Jefferson County. The data have not yet been tabulated.

State Fair. The State Fair of 1923 was undoubtedly the best ever held in New York. The attendance reached a new record and the exhibits in the various departments were unusually good, both in quantity and in quality. The college exhibits were revised to bring them up to date and to emphasize subjects of timely importance. The persons in charge of these exhibits report a greater and more intelligent interest by visitors than ever before. The overshot water wheel, erected by the Department of Rural Engineering, showed the possibilities of the use of small streams in generating electricity for use at the farmstead, and operated many electrical appliances in an adjacent model kitchen. The exhibit of the Department of Agronomy showed the inside of the fertilizer bag by means of graphic illustrations, and presented a convincing comparison of the relative values of high- and low-analysis fertilizers. The Department of Plant Breeding had an excellent exhibit showing the comparison of yields by the use of better seeds, and in an adjoining booth the Department of

Dairy Industry showed by comparison the products of a high-producing cow and those of the average-producing cow. The main purpose of this exhibit was to induce the dairymen to keep records, and to think and act on the results of such records.

The forestry exhibit emphasized reforestation; that of poultry featured caponizing; that of vegetable gardening showed how to select good vegetables, and the value of vegetables as food. The Office of Publication, with its representation of a farm home, showed how bulletins and correspondence courses bring the College to the individual by mail. The Department of Floriculture and Ornamental Horticulture, with a full-sized exterior of a home and a beautifully planned and planted lawn in contrast to one not so well arranged, showed pointedly the right and the wrong way to plant.

Besides its exhibits, the College made its usual contribution to the fair by furnishing superintendents of departments and assistants, and also judges and supervisors of various contests.

Town and county fairs. As in 1923, the assistance rendered to town and county fairs consisted largely of demonstrational judging. Only one exhibit was furnished to a county fair. Pageants continued to be popular. Two of these were written, and coaching assistance was given by the administrative staff. They proved to be very successful. In addition, outlines were prepared for similar events at other fairs. The Little Country Theatre continued to be popular. A total of 86 days of assistance by specialists was given to 37 fairs in 32 counties.

Extension schools. A comparison of extension-school figures for the past five years shows no decided change for the year just closed. Fewer schools were held this year, due to a more careful selection of places. There were fewer failures. The average enrollment per school showed an increase of 3.65, and the average attendance per session an increase of 3.21. Of the 38 schools held, 21 provided instruction in some phase of rural engineering. The special poultry and fruit schools also continued to be popular. Subject-matter instruction was given for the following numbers of days: agricultural economics and farm management, 9; agronomy, 21; animal husbandry, 16; entomology, 6; plant pathology, 7½; pomology, 17½; poultry, 30; rural engineering, 158.

In addition to the foregoing, two schools were organized in cooperation with secondary schools of vocational agriculture at Trumansburg and Alfred, respectively. These were arranged primarily for the instruction of students between the ages of fourteen and twenty-five, many of whom are not normally reached by any other type of extension service.

Lectures and demonstrations. Very little change is noted in the types of meetings attended by specialists. The tendency mentioned last year toward "fewer meetings, with smaller groups of persons selected both on the basis of common interest in a definite project and on leadership ability," was particularly noticeable in some phases of the program and in certain counties.

The one-day meetings for instruction in the cleaning and care of sewing machines were continued with increasing popularity. Through cooperation with the State Department of Education, specialists have been made

available to attend regional meetings of the teachers of vocational agriculture in secondary schools, for their professional improvement. There were fewer institutes and single-session community meetings held during the regular winter season than usual. This decrease was offset by an increased number of field engagements for specialists during the spring and early summer.

The College assisted with demonstration cars operated on the Erie and New York Central Railroads, showing poultry marketing and economical dairy production, respectively. The Erie car made 17 stops, at which 2111 persons visited the exhibits and attended the lectures. The New York Central car made 25 stops, with an aggregate attendance of 7714.

The following summary gives a rough comparison of numbers of persons reached by subject-matter specialists in their field work during the past five years. It does not include the activities of administrative officers and special spray-service assistants. A more detailed record of meetings and demonstrations during the year 1923-24 is given in the table on page 46.

Year	Number of field days	Number of teaching contacts	Contacts per day
1919-20	4,796	171,781	35.8
1920-21	6,047	270,239	44.7
1921-22	5,669	232,745	41.1
1922-23	6,057	210,520	34.7
1923-24	5,939	209,222	35.2

The work of the supervisory officers was about equally divided between the field and the office. The field work included conferences with county agents, county executive committees, local leaders, and representatives of cooperating agencies; lectures at larger county and state meetings; and attendance at conferences, conventions, and annual meetings of state-wide organizations. The data are given in the following table:

SUMMARY OF EXTENSION ADMINISTRATIVE OFFICERS' FIELD ACTIVITIES
FROM JULY 1, 1923, TO JUNE 30, 1924

Office	Days in field	Conferences		Training meetings		Lectures		Miscellaneous (number of days)	Number of personal contacts
		Number	Attendance	Number	Attendance	Number	Attendance		
Agricultural agent leaders..	487	447	4,744	1	4	25	5,433	100	10,181
General administration....	390	322	1,723	58	1,941	154	21,343	76	25,007
Home demonstration agent leaders.....	430	692	2,613	200	6,181	111	16,626	38	25,420
Junior extension leaders...	252	721	3,006	3	38	45	3,584	28	6,628
Publications.....	113	24	458	6	227	31	4,490	56	5,175
Total.....	1,672	2,206	12,544	268	8,391	366	51,476	298	72,411

SUMMARY OF EXTENSION SPECIALISTS' FIELD ACTIVITIES FROM JULY 1, 1923, TO JUNE 30, 1924

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Number of farm and home visits	Conferences		Lectures		Miscellaneous (number of days)	Number of teaching contacts
		Number	Attendance	Number	Attendance	Number	Attendance		Number	Attendance	Number	Attendance		
Agricultural Economics.	354	79	3,425	16	752	1	6	246	30	247	295	12,645	62	17,324
Agonomy.....	297	7	51	122	1,114	.....	.....	343	30	234	207	7,618	25	9,360
.....	521	160	4,395	2	130	.....	.....	403	41	177	320	8,228	92	13,332
.....	203	57	111	4	19	.....	.....	60	180	488	27	1,452	50	2,139
.....	244	50	1,979	2	65	5	80	128	117	465	101	4,914	51	7,631
.....	152	27	798	19	475	1	9	74	35	285	100	7,080	41	8,721
.....	60	10	71	7	273	.....	.....	17	17	51	7	2,084	23	2,496
.....	178	.....	.....	13	90	.....	.....	285	19	79	12	349	72	812
.....	253	52	1,103	4	608	.....	.....	505	70	250	79	3,639	50	6,125
.....	218	116	5,186	57	631	.....	.....	243	13	240	79	2,715	37	9,015
.....	1,206	348	10,773	26	620	9	139	1,499	110	1,253	384	15,040	141	29,430
.....	19	.....	.....	.....	.....	.....	.....	.....	9	118	10	2,970	.....	3,088
.....	601	675	14,097	27	299	.....	.....	271	11	57	4	216	115	14,040
.....	232	162	7,189	30	1,900	130	2,431	.....	30	438	35	3,429	2	15,387
.....	315	36	827	30	1,508	4	71	303	138	849	318	20,801	39	24,359
Total agriculture.....	4,853	1,779	50,005	368	8,493	150	2,736	4,385	850	5,331	2,044	93,209	800	164,159
Home Economics.....	1,085	49	2,803	32	1,104	627	8,274	14	1,186	4,107	572	28,701	65	45,063
Total.....	5,939	1,828	52,808	400	9,637	777	11,010	4,399	2,036	9,438	2,616	121,910	865	209,222

Office service of extension specialists. Until recently no detailed study has been made of the work of specialists except when they were in the field. From figures now available for the fiscal year ended June 30, 1923, it appears that in that year there was a total of 11,461 available days from 39 specialists on full time and 16 specialists on half time or more. Out of this total, 5617 days, or 49 per cent, were spent in the field or *en route*, and 5844 days, or 51 per cent, were spent at the College. In addition, 2416 days of field service were contributed by special spray-service assistants, institute workers, and part-time employees, and resident teachers. In the 5844 days spent at the College by specialists, the preparation of 36,794 personal letters and 13,265 circular letters, and the reception of 8730 office calls, consumed 1110 days. Twenty bulletins were prepared in 353 days. The preparation of 1075 mimeographed articles, 409 magazine articles, and 975 press articles, required 539 days. The examination of samples such as diseased plants, insects, feeding stuffs, fertilizers, soils, weeds, seeds, dairy products, building and planting plans, farm accounts, and the like, took 253 days. The correction and return of 2973 papers from 573 correspondence-course students required 295 days. The working-up of reports and records, and the preparation of teaching materials for the field, required 1934 days. There were 1613 days spent in conferences and staff meetings, and 326 days in Farmers' Week, Field Days, and the like. In addition, 421 days were spent in miscellaneous activities not accounted for in reports. The work of the extension specialist is not confined to work in the field. It is by no means so simple a matter as boarding a train to go out and make a speech. There are required a multitude of activities to prepare for field work, and even more time to attend to the correspondence and the preparation of material for the printed word which goes directly from the College to its constituents.

Farm bureaus

In spite of many obstacles due primarily to the financial depression among farmers, the farm bureaus have kept an even keel and have made marked progress in both the quality and the quantity of the work accomplished during the year. The county agents, with a spirit of optimism and devoted service, have given valuable assistance to farmers, especially to those who have found it necessary to make many changes in their farm enterprises due to the changed economic conditions. In fact, it may be said that one of the major developments of the year has been along economic lines.

Changes of agents have taken place in nineteen counties. Many reasons may be given to account for the large number of changes, but the chief reason seems to be that the men have had good opportunities to improve themselves financially or to take up a line of business which has long been in their minds. A few of the changes have been due to transfers to other counties, which may be called promotions.

The supervisory program for 1923 of the central office of farm bureaus has been carried out through cooperation of county agents, specialists, and administrative officers. The important features of this program include: the securing of definite programs by counties and communities;

the development of project leaders who will assume responsibility for carrying out community programs; the outlining of communities in all counties; the establishing of systems for keeping records by communities; the correlation of efforts of extension specialists and the central office staff on programs in counties; the development of a written supervisory program for each county; assistance in the correlation of the work of the farm bureau, home bureau, and junior extension departments; the maintaining of a complete and up-to-date history of the work in each county; the maintaining of more frequent contact with members of county executive committees. This program is fairly comprehensive, and might well be called a long-term rather than a yearly program. Sufficient progress has been made on it, however, to indicate that these items, together with minor additions, should constitute the main work of the central office for the next few years.

Farm bureau work was conducted for the entire year, and farm bureau agents were employed throughout the year, in each of fifty-five counties. During the calendar year 1923 the farm bureau associations handled \$449,137.29 of local funds, as compared with \$493,978.64 in 1922. This is a decrease of \$44,841.35, or 9.1 per cent. The major part of this decrease is not actual, as is explained in the following account of supervisors' appropriations. However, greater efficiency has been exercised, and so the actual operating expenses are lower, as is explained later.

County boards of supervisors appropriated for 1923 a total of \$201,999.79 for farm bureau work as compared with \$234,291.39 for 1922, a decrease of \$32,291.60. Approximately 47 per cent of the local funds was obtained from supervisors' appropriations. In computing the cash receipts from supervisors' appropriations for 1922, there were included certain sums due to farm bureaus in 1921 but not received until 1922. This was not the case in 1923. Also, certain sums were appropriated to farm bureaus for transfer to home bureaus and included in the 1922 receipts of farm bureaus. Such items were not included in the 1923 financial report. The foregoing items account for the apparent reduction in the amount of receipts from supervisors' appropriations in 1923. The actual amount appropriated by supervisors in 1922 was \$204,964. and in 1923 it was \$204,334.49, a reduction of \$629.51.

A total of \$137,628.46 was received from membership as compared with \$138,458.51 in 1922, which is a decrease of \$830.05, or an average decrease of \$15 per county. The total expenditure of local funds was \$427,243.02 in 1923 as compared with \$471,856.16 in 1922. The percentage of all funds coming from local sources remained about the same as in 1922, the figures being 84 per cent in 1923 and 85 per cent in 1922. This indicates that both farmers and boards of supervisors are maintaining their usual share of the financial support of the farm bureaus.

There was a slight decrease in the average salary paid a county agent, which was \$2766 in 1923 as compared with \$2814 in 1922. This is due primarily to the resignation of several of the older men who had been receiving larger salaries than the average. The amount of money expended for salaries of assistant agents was \$4000 less in 1923 than in 1922. The costs of operating automobiles and printing the farm bureau news were

less, and the amount of money paid to the State Farm Bureau Federation was several thousand dollars less due to the decrease in the number of members. On the other hand, there was an increase in the payments for extension service and in the cost of stenographic service. The present worth of the farm bureaus (inventory and cash on hand) is \$3461 more than in 1923.

Notwithstanding the fact that less money was expended in 1923, both the quality and the quantity of the work have seemed to increase. One reason for this is that more volunteer service is constantly being performed by community project leaders, which certainly marks an advanced step in farm bureau activities and indicates that farmers gradually are assuming their share of the responsibility of conducting the work.

The total number of paid members in 1923 was 34,529. On May 1, 1924, there were 22,434 paid members reported. This is not a bad showing in view of the fact that in the majority of the counties the plan of campaign was changed from the use of paid solicitors to volunteer service by farm bureau committeemen. In 1923 the farm bureau was oversold in many counties, and many members were gained who normally would not be members of the farm bureau. The 1924 campaign was run on a much sounder basis, the main appeal being for farmers to join the farm bureau in order to support an educational organization with programs of work developed to meet the needs of particular communities.

One of the important activities conducted during the past year has been a continuation of the development of county and community programs. A new feature was added to the program-making for the year, called the *service, or questionnaire*, campaign method. In most of the counties, outlines, usually in the form of questionnaires, were sent to members, and in some cases to all farmers, stating the kinds of service which the farm bureau was capable of performing and asking each farmer to check those items which concerned him the most and on which he desired help. In many counties these outlines formed the basis of the membership campaign, and were referred to by community committees in the development of their programs.

During the year an earnest attempt has been made, in many of the counties, to improve the morale of members and leaders by means of an increase in recreational and social functions. In many counties, get-together meetings of committeemen have been held with the chief purpose of getting these men better acquainted with one another and of inspiring them to renewed activity in farm bureau work. In some counties social meetings of community committees have been held, and the annual winter-meeting in the community has, in many cases, included recreational and social features for the benefit not only of members but of all farmers residing in the community. It is generally believed that more attention should be given to strengthening the morale of leaders and members, especially during the present period of agricultural financial depression.

As has been the custom for the past few years, an analysis of progress and results has been made in practically all of the counties. Such an analysis is probably of most value to the county agent, who spends a day with a representative of the central office in going over each project to

determine the progress made and the results obtained. Each leader is considered, and methods of improving the work during the coming year are decided upon. By comparing the scores for previous years with the scores for the current year, the weak spots can be easily determined. The analysis also enables the county agent leader to compare one county with another, and thus obtain definite data to support his recommendations to the county executive committee.

The county agents have cooperated closely with the departments at the College, during the year, in bringing about a more thorough understanding of facts relating to the more economical production and marketing of farm products. The value of recommended fertilizers has been explained through community meetings and the farm bureau news. This has done much to reduce the number of brands of fertilizers offered by fertilizer companies in New York State. Meetings have been held also to acquaint the farmers with the new grades of hay, and how they can best conform to them. Heretofore much of the hay shipped to New York City has been unclassified, and the price has been determined by the general demand with little reference to the grade variation.

The most intensive animal husbandry project has been the campaign for the eradication of bovine tuberculosis among dairy cattle. Active cooperation has been rendered by the county agents and the farm bureau associations in carrying out the plans of the State Department of Farms and Markets and the United States Department of Agriculture in this campaign. Clean-up campaigns have been conducted in Essex, Greene, Cattaraugus, and Steuben Counties. The campaign was practically entirely effective in Essex County. In addition, area work is being conducted in eight counties and other testing is being done in a scattered way in most of the other counties. The majority of the dairy counties are continuing work on long-term programs to improve the methods of feeding and taking care of dairy cattle. Cow-testing associations have been continued in the more intensive dairy sections. County agents spent a considerable amount of time and energy in securing a representative attendance at the National Dairy Exposition held in Syracuse.

Because of the required readjustment of farming enterprises made necessary by the unusual conditions resulting from the World War, the farm-management work has centered largely on studies to determine just what changes are needed in particular localities. In several counties this work is conducted through farm bureau leaders who aid in engaging the cooperators and in calling meetings of these cooperators. The specialist and the county agent assist the men in keeping their accounts, making a study of their figures, and making comparisons with figures from other localities. An inventory and credit-statement campaign is being carried out on a large scale in Chautauqua County, in cooperation with the county agent and local leaders. Many farm bureau tours have been conducted for the purpose of visiting farms to study them from a farm-management standpoint.

For several years, scattered demonstrations in reforestation have been placed by county agents in several of the counties for the purpose of showing the method of setting forest trees and determining their adaptability and rate of growth on particular types of soil. This year a concerted

effort was made by an agreement between the College of Agriculture and the State Conservation Commission, in which the Commission set aside 10,000 trees for each county, to be used for demonstration purposes. A general increase in forest planting resulted. Cooperation has also been rendered in the control of white pine blister rust.

In cooperation with the Department of Plant Breeding at the College, the results of experiments covering a number of years have been largely given to communities at winter meetings and demonstrated by means of field tests. Results of this work are marked in Cornell Number Eleven corn, which is now available in almost unlimited quantities.

The spray information service has been continued with increasing effectiveness. There has also been cooperation with the Department of Vegetable Gardening in promoting the use of improved potato seed; with the Department of Rural Engineering in connection with the use of water systems, sewage disposal, care of gas engines, rope splicing, and knot tying; with the Department of Poultry Husbandry in the employment of experienced men to cull flocks and in the holding of demonstrations; with the Department of Rural Education in giving out information as to the findings of the report of the Committee of Twenty-one, which made a rural school survey of the State and submitted recommendations to rectify conditions which they found; and with the Department of Rural Social Organization in connection with the recreational and social features of the farm bureau programs.

Home bureaus

The home bureau organization has been extended, during the year, to Chautauqua, Seneca, and Schuyler Counties and has been restored in Niagara County, where the county funds lapsed temporarily because of a local situation which had no relation to the soundness of the program carried forward by the county home bureau. Besides the thirty-six county and three city home bureaus now in operation, interest in the development of the organization is evident in additional counties, notably St. Lawrence, Franklin, and Columbia, where organizations are being developed. Many inquiries from homemakers in other counties indicate that the home bureaus are no longer merely an experiment in adult education in home economics, but that they are recognized as an integral part of public education in the State.

The rural community units of the organization now number more than 1042 as listed in the latest compilation of December, 1923. They have grown not only in numbers but also in efficiency during the past year, due in large measure to the training schools in administrative leadership conducted by the College.

The local financial support of the home bureaus has shown an increase this year over that given last year, and the difficulties experienced in securing county appropriations, which characterized the enterprise a few years ago, have been almost entirely overcome.

That membership is holding its own during a year of agricultural financial depression is encouraging. But the most significant fact about the membership is that it is a participating and not merely a recipient membership, since more than 5000 of the 27,000 home bureau members are

actively enlisted in the home economics extension service, as officers, as committee members, or as project leaders in the program for which the New York home bureau organization serves as a means of communication between homemakers and the College.

Junior extension

The number enrolled in junior extension and actually carrying on projects under local or county supervision increased from 13,489 to 14,262 during the past year. Of twenty-two counties having paid leadership, fifteen increased their budgets, six made no change, and the remaining county discontinued the service. One county was newly organized during the year. There are other evidences of increased interest on the part of rural people in the work. The last session of the Legislature amended the law relating to county work so that specific authority was given to county boards of supervisors to make appropriations for junior extension, and the State is obligated to pay \$600 toward support of the work in counties meeting the financial requirements of the Act.

Office of Publication

The work of the Office of Publication during the past year, while more comprehensive than in previous years, has developed along practically the same lines which have proved successful in the past. The volume of work has shown a decided increase although the number of publications has remained about the same — 77 in 1924 as compared with 74 in 1923. This number, however, does not include several periodical publications, such as the *Extension Service News* and the *Service Sheet* for country newspapers, which are issued monthly. These, with other booklets, bring the total number of publications up to somewhat more than a hundred, or more than eight times as many as are issued by a monthly magazine publishing business, and more than twice as many as are issued by a weekly magazine plant. The publications issued during the year have had about the same number of total pages as in 1923, and the total number of copies printed is increased by about 50,000.

The former close relationships with the newspapers of the State have been maintained, and a new feature of the work of the office has consisted in organized assistance for county agents, particularly the home bureau agents, with their local newspapers within the counties.

Before the end of the fiscal year Professor M. V. Atwood tendered his resignation, to accept the managing editorship of the *Utica Observer-Dispatch*. Although his actual severance of service is set for the early part of the coming fiscal year, it seems desirable to record now, rather than a year hence, appreciation for his most valuable service in organizing and administering the distribution of publications, for his upholding of the main burden of the news writing, and for his valuable aid in maintaining the cordial relations existing between the College and the press of the State.

The office was represented at the annual conference of the American Association of Agricultural College Editors at New Brunswick, New Jersey, and its members have been called upon to judge newspaper exhibits

in several States. At this annual conference the College received first prize for the best exhibit of published work as a whole, and numerous other awards including first prize for the best technical bulletin.

News service. No marked changes have been made in the news service during the past year, except that by means of greatly increased facilities 1585 separate news items were sent to the newspapers of the State as compared with 878 last year. The usual plate service and ready-print service were maintained, and closer relationships were established with the offices of the Associated Press. In order to obtain definite knowledge of the use which is being made of the news items, after a discontinuance of the press clippings for two years the services of a clipping bureau were subscribed to beginning with the calendar year 1924. The clippings for each month indicate that the news from the College is being more generally printed than ever before. In the month of May the clippings recovered showed a total circulation of more than 26,000,000, or nearly as many as in the entire year of 1915 when the news service was established.

Distribution of publications. During the year a total of 1,350,463 publications were distributed by all methods, and 62,425 letters and post-cards requested bulletins by mail. This coincides fairly with 1,076,635 publications distributed last year, although in that year only 42,912 requests were received in the mail.

In order to ascertain how many publications were distributed outside the State, a separate tabulation of these was kept. In March, 1924, of a total distribution for the month amounting to 169,716 publications, 8274 were sent outside the State. These went to every State of the Union with the exception of Nevada. Canada received 210, and other countries received 531. The distribution for March showed a four-per-cent increase over that for the same month in the preceding year, and from January through March there was a two-per-cent increase in distribution. The first three months of the year seem to be the ones in which farmers do most of their reading. From March 1 to May 31, or during the three months of March, April, and May, 95,712 publications had been mailed outside the State; of these, 9744 were experiment station publications and 85,968 were extension bulletins of various sorts.

The cut exchange, maintained in connection with the farm bureau news service, now contains 1828 engravings for use by the county farm and home bureau organs, of which 458 were loaned during the year.

Study courses. With nearly as many persons enrolled in the study courses since July 1, 1923, as in the preceding three years, and almost twice as many courses completed, the office has handled approximately as many reports in 1924 as in those years. The college departments are taking a greater interest in study courses as an efficient way to reach farmers, with the result that extension agents are recommending them to a larger number of persons. Letters received during the year contain definite records of eighty-eight changed methods as a result of study courses. These range from improved feeding and marketing of poultry to actual rearrangement of fields, buildings, and crop rotations. Nearly every person who completes a course reports at least two definite ways in which it has helped him, and the office receives in addition a large number

of general statements of appreciation. The increased usefulness of these courses is due largely to the fact that the specialists fit their remarks on the reports to individual cases.

Four courses — orchard fruits, milk production, vegetable gardening, and poultry — have been completely rewritten in order to take advantage of new textbooks or improved methods of presentation, and many departments giving courses have prepared bulletins for the purpose, in part at least, of bringing their study courses up to date. Study-course exhibits at the 1924 Farmers' Week were handled entirely by the departments as a part of their instruction work.

County agricultural agents have given increased attention this year to study courses, both in their farm bureau news and in recommending the courses to committeemen and other farmers. Many agents have visited persons who take the courses, and some of the agents included study courses in their lists of services to farm bureau members. A brief account of the study courses was included in the 1924 edition of the *Grange Lecturer's Handbook*, and the manager of the New York State Sheep Growers' Cooperative Association, Inc., in a circular letter called the attention of all in the wool pool to the study course in sheep and wool production.

The office helped the Department of Rural Education in handling the records of a correspondence course in rural school administration which was offered to some twenty district superintendents. A new course in farm bureau leadership was prepared by the office of the county agent leader, and was offered to farm bureau committeemen through county agricultural agents.

Another development is the preparation by the Department of Rural Engineering of a course, comprising four units, to be used next fall both as a general study course in farm mechanics and in connection with the junior project in that subject. Several other departments, including Dairy Industry and Agronomy, are looking forward to the preparation of study courses for which there has been a demand.

At the end of the fiscal year, ten regular study courses are being offered to residents of the State. The number of enrollments and reports received in each since July 1, 1923, follows:

	Enroll-ments	Reports received
Beekeeping	23	246
Farm management	107	1,082
Milk production	54	448
Orchard fruits	36	250
Pork production	8	25
Poultry	272	1,768
Sheep and wool production.....	35	197
Small fruits	20	117
Vegetable forcing	14	82
Vegetable gardening	29	199
Total	598	4,414

In addition, the 21 members enrolled for the course given by the Department of Rural Education sent in 131 reports, and the 17 enrolled for the

course in farm bureau leadership sent in 1 report, making a grand total for the year of 636 enrollments and 4546 reports.

Publications issued. The following tabular statement shows the kinds and the titles of publications, together with the number of printed pages and the size of edition of each:

	Number of pages in printed pub- lication	Number of copies printed
MEMOIRS:		
70 The inheritance of blotch leaf in maize (Plant Breeding)	16	3,500
71 Some studies on the neutralization of cream for butter-making (Dairy Industry).....	18	3,500
72 The inheritance of a lethal pale green seedling character in maize (Plant Breeding)	23	3,500
73 Crown-gall of apple and peach, with notes on the biology of <i>Bacterium tumefaciens</i> (Plant Pathology).....	19	3,500
74 Catalase activity in dormant apple twigs: its relation to the condition of the tissue, respiration, and other factors (Pomology)	33	3,500
75 Nitrate of soda in the nutrition of the tomato (Vegetable Gardening)	86	3 500
Total	195	21,000
EXPERIMENT STATION BULLETINS:		
422 The social areas of Otsego County (Rural Social Organization)	46	6,000
423 The standard of life in a typical section of diversified farming (Rural Social Organization).....	133	5,000
424 Studies of various factors influencing the yield and the duration of life of meadow and pasture plants (Plant Breeding)	24	10,000
425 Studies on the treatment and the disposal of dairy wastes (College of Engineering)	188	6,000
426 The movement of farm population (Agricultural Economics and Farm Management).....	95	8,000
427 Farm motor trucks in New York (Agricultural Economics and Farm Management)	56	8,000
428 The clover-seed caterpillar (Entomology).....	34	6,000
429 The control of bacterial blight of celery by spraying and dusting (Plant Pathology)	30	4,000
Total	606	53,000
READING-COURSE LESSONS FOR THE FARM:		
119 (Reprint) The curing of meat and meat products on the farm (Animal Husbandry)	16	4,000
121 (Reprint) The culture of garden roses (Floriculture and Ornamental Horticulture)	24	3,000
123 (Reprint) Top-working and bridge-grafting fruit trees (Pomology)	24	5,000
133 (Reprint) Preparation of eggs for market (Poultry Husbandry)	40	10,000
157 (Reprint) Feeding for egg production (Poultry Husbandry)	40	8,000
161 (Reprint) Diseases interfering with reproduction in cattle (Veterinary College)	24	1,000
Total	168	31,000

READING-COURSE LESSONS FOR THE HOME:

31 (Revised reprint) Household bacteriology (Home Economics)	18	5,000
87 (Reprint) The decorative use of flowers (Home Economics)	28	5,000
114 (Reprint) Principles of jelly making (Home Economics).	16	5,000
134 (Revised reprint) Household insects and their control (Entomology)	40	5,000
138 (Reprint) Saving strength in the household (Home Economics)	20	5,000
Total	<u>122</u>	<u>25,000</u>

EXTENSION BULLETINS:

9 (Reprint) Gladiolus studies-I. Botany, history, and evolution of the gladiolus (Floriculture and Ornamental Horticulture)	100	2,000
10 (Reprint) Gladiolus studies-II. Culture and hybridization of the gladiolus (Floriculture and Ornamental Horticulture).	84	5,000
23 (Reprint) Suggestions to purchasers of farm lands in New York (Agronomy)	28	3,000
45 (Reprint) Cornell poultry rations (Poultry Husbandry)... ..	8	10,000
47 (Reprint) List of popular publications (Extension Service).	4	91,000
49 (Reprint) Estimating the value of timber in the farm woodlot (Forestry)	28	3,000
50 (Reprint) The farm water supply. Part I. Simple water systems and plumbing (Rural Engineering).....	75	10,000
62 (Reprint) Hitches, knots, and splices (Rural Engineering).	76	15,000
64 (Reprint) Raspberries, blackberries, and dewberries (Pomology)	16	5,000
67 The flower garden (Floriculture and Ornamental Horticulture)	42	13,000
68 Organic matter in the soil (Agronomy).....	14	10,000
69 Making the country weekly more attractive (Extension Service)	29	5,000
70 Food-selection score card (Home Economics).....	4	10,000
71 Food-value chart (Home Economics).....	4	15,000
72 Transmission of power by means of pulleys, belts, and shafts (Rural Engineering)	42	8,000
73 Rearing calves and heifers (Animal Husbandry).....	20	6,000
74 The family garden (Vegetable Gardening).....	34	10,000
75 The planting and the early care of the commercial apple orchard (Pomology)	43	8,000
76 Starter for butter, cheese, sour cream, and commercial buttermilk (Dairy Industry)	15	6,000
77 Making the printed word work for you (Extension Service).	8	10,000
78 Liming New York soils (Agronomy).....	23	10,000
79 Tobacco wildfire (Plant Pathology).....	7	3,000
80 Oats for New York farmers (Plant Breeding).....	17	7,000
81 Culture of asparagus (Vegetable Gardening).....	12	6,000
82 Play production for the country theatre (College of Arts and Sciences)	78	8,000
83 Some results of dairy improvement associations (Animal Husbandry)	19	6,000
84 Alfalfa production for New York (Agronomy).....	21	8,000
85 The gas engine on the farm (Rural Engineering).....	52	10,000
86 The apple and thorn skeletonizer and its control (Entomology)	7	5,000
87 Grading, packing, and handling head lettuce in New York State (Vegetable Gardening)	10	5,000
Total	<u>920</u>	<u>313,000</u>

UNIOR EXTENSION BULLETINS:

1 (Revised reprint) First lessons in sewing (Home Economics)	33	10,000
2 (Reprint) Elementary garment making (Home Economics) ..	28	10,000
7 (Reprint) First lessons in food study (Home Economics) ..	84	10,000
8 (Revised reprint) Corn growing for boys and girls (Vegetable Gardening)	20	5,000
10 (Reprint) Food project programs (Home Economics)	28	5,000
11 (Reprint) Vegetable gardening for boys and girls (Vegetable Gardening)	35	15,000
Total	228	55,000

RURAL SCHOOL LEAFLETS:

September, 1923 (Rural Education)	152	25,000
November, 1923 (Rural Education)	38	140,000
January, 1924 (Rural Education)	48	120,000
March, 1924 (Rural Education)	44	120,000
Total	282	405,000

MISCELLANEOUS:

(Reprint) How to take a farm inventory and make a credit statement (Agricultural Economics and Farm Management) ..	19	10,000
(Reprint) How to keep an account with a crop (Agricultural Economics and Farm Management)	15	5,000
How to keep an account with dairy cows (Agricultural Economics and Farm Management)	24	5,000
How to keep a cash account on a farm (Agricultural Economics and Farm Management)	36	5,000
Food preservation project record sheet (Home Economics)	4	5,000
Junior Field Days announcement	8	5,000
Junior Field Days program	8	2,000
Program of the seventeenth annual Farmers' Week, 1924	32	12,000
Alumni directory of the New York State College of Agriculture (Revised reprint) Cornell extension service handbook (Extension Service)	94	6,000
Total	471	56,000

ANNUAL REPORT FOR 1923	104	3,800
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ANNOUNCEMENTS:

Announcement of the New York State College of Agriculture ..	80	15,000
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SUMMARY

	Total number*	Total pages	Copies
Memoirs	6	195	21,000
Experiment station bulletins	8	606	53,000
Reading-course lessons for the farm	6	168	31,000
Reading-course lessons for the home	5	122	25,000
Extension bulletins	30	920	313,000
Junior extension bulletins	6	228	55,000
Rural school leaflets	4	282	405,000
Miscellaneous	10	471	56,000
Annual report	1	104	3,800
Announcements	1	80	15,000
Total	77	3,176	977,800

* Including reprints.

Agricultural Economics and Farm Management

Special farm-management service. The special farm-management service, organized in Genesee County in 1921, is one of the newer extension projects of the Department of Agricultural Economics and Farm Management. During the past year it was continued on nine farms in Genesee County, and was extended to forty-three farms in Chautauqua, Monroe, Oswego, and Orleans Counties. An extension specialist from the department makes a labor-income survey of the farm business, prepares a map of the farm showing field lines and acreages and furnishes the farmer with blueprint copies, makes a farm-management study and analysis of the farm business, and tries to find ways of increasing the profitableness of the farm. At the end of the year the extension specialist has a conference with the farmer, takes another labor-income record, discusses recommendations for possible changes in farm organization, layout, or building arrangement, and gives whatever assistance is desired in summarizing or starting farm accounts. Because of the labor and expense involved, it has been necessary to limit this service to only a few of the counties applying for it. The service has usually been placed in counties where considerable other farm-management work is being done. The farmers included in it are generally farm-management project leaders in their communities, and in this way serve as leaders for future extension work.

Extension schools and community meetings. During the period from July 1, 1923, to June 30, 1924, members of this department have conducted, in cooperation with other departments, three extension schools having a total cumulative attendance of 349. Extension specialists have given 390 lectures and demonstrations, with a total attendance of 16,825. Most of these lectures and demonstrations were given at farm bureau community meetings, grange meetings, and meetings of farmers' clubs, but a number were given at meetings of Cornell alumni clubs, businessmen's associations, and rotary clubs. The principal subjects discussed, in order of their importance, were: prices of farm products, why some farms pay better than others, how to take a farm inventory and make a credit statement, the use of farm credit, how to keep an account with a crop, the cost of milk production, the cost of operating farm trucks and tractors. The present agricultural depression has been very clearly reflected in the subjects requested for discussion by farmers. There has been a large increase in the requests for discussion of farm prices and farm credit. The subject of prices has been the background for approximately three-fourths of the lectures given at community meetings, and special emphasis has been laid on the need for the adjustment of farming to present prices and probable future prices. The subject of how to take a farm inventory and make a credit statement, which was discussed at eighty-five meetings, was used as a background for teaching the value of getting and using bank credit instead of store credit. The present high cost of farm labor has resulted in more than the usual interest being taken in the cost of operating farm trucks and tractors, and in the results of studies on the cost of milk production.

Farmers' institutes. During the year extension specialists from this department have given 97 lectures and discussions at farmers' in-

stitutes, with a total of 2795 personal contacts. Most of the institute work was performed by special non-resident extension workers.

Conferences. Members of the department have held, during the year, 30 conferences with officers or committeemen of local farm bureaus, agricultural teachers, and officers of agricultural associations, for the purpose of organizing special farm-management work or for the discussion of farm-management problems. The first of a series of farm-management conferences with high-school agricultural teachers was held at Avon on May 9 and 10. A part of the time was spent in reviewing and discussing the teaching, research, and extension work of the department. Survey records were taken on two farms and an intensive study was made of their businesses. Plans for teaching the different phases of farm management in high schools were drawn up.

In addition to the farm-credit work done through community meetings and extension work, the department cooperated in organizing a banker-farmer conference held at Ithaca on July 23 and 24, 1923. At that conference leading farmers from various parts of the State, and officers of country banks, discussed ways of promoting better business relations between farmers and banks. Several other banker-farmer conferences were attended by members of the department during the year.

Correspondence courses. The correspondence course in farm management is being continued, and the enrollment has increased from 53 to 105. It is planned to enlarge the work and to divide the present course into three shorter courses which will take up, respectively, general farm management, farm accounting, and agricultural prices.

Farm accounting. The work in cooperative cost accounting has been conducted on the same basis as heretofore. During the year 410 farm account books were distributed to farmers at cost, and complete sets of cost accounts were closed on 36 farms. Summaries and analyses of the accounts are used in extension teaching and also placed in the county agent handbook.

In the spring of 1923, as a result of a series of community and farm bureau meetings held in Genesee County, approximately 100 farmers started to keep accounts of their crops. In January of 1924 a member of the department assisted the farm bureau manager of that county in summarizing the 66 usable accounts that had been completed. Each farmer was furnished with a summary and analysis of his own account and the average figures from all other accounts of the same kind. Similar work was started this year in Niagara, Orleans, Monroe, Nassau, and Wyoming Counties. Crop accounts kept cooperatively in this way by a group of farmers furnish them with valuable information on the relative profitableness of different crops, and on ways of making more profitable any particular crop which they are raising.

Farm-inventory and credit-statement campaigns. Special farm-inventory and credit-statement campaigns were conducted in Chautauqua and Tompkins Counties in cooperation with the county farm bureaus and the officers of country banks. Three members of the department spent four days in Chautauqua County, each holding three barn meetings a day at which a farm inventory was taken and farm-credit statements and the use of banks by farmers were discussed. These meetings were attended

by 376 farmers, 90 per cent of whom signified their intention of taking an inventory of their farm business and making out a credit statement. A similar campaign was conducted in Tompkins County with a total of 21 meetings and an attendance of 168 farmers.

Farm-management tours. During the year fourteen farm-management tours and two dairy-barn tours were conducted. Tours offer an excellent opportunity for doing extension work with a group of farmers at a season of the year when it is not practicable to hold community meetings. Attendance at these tours totaled 2439.

Personal work with farmers. Members of the department made 458 personal farm visits during the year. Of this number, 212 were made in connection with the dairy-farm survey work in Chenango and Madison Counties. In addition, many office and correspondence calls were responded to by members of both the extension and the teaching staff.

The dairy-farm survey. In the summer of 1923 the dairy-farm survey work, conducted in cooperation with the United States Department of Agriculture, was continued in Chenango County, where 104 farms were revisited, and in Madison County, where 108 records were obtained. This provides data for two consecutive years on farms producing grade B milk with cabbage, potatoes, and market peas as cash crops, and on farms producing grade B milk where alfalfa hay is the chief dry forage.

Agronomy

The extension work in soil management and field-crop production through the year has followed a well-established program. Attention has been given to each of the twelve subprojects included in the following list: lime; fertilizers; farm manure; organic matter and green manures; soil tillage and cultivation; soil improvement through crop rotation; pasture management; silage-crop production; alfalfa production; forage-crop production; small-grain production; weed eradication.

Particular emphasis has been placed on the economy of field-crop production. Profitable production, rather than maximum yield alone, has been the aim throughout the year. A change of practice in the management of farm soil or in the cropping system has not been advocated unless justified on the basis of economy.

Farmers have been urged to meet their soil and crop needs through better farming methods rather than by increasing their expenditure for fertilizer and other soil-improving materials. The practices advocated include an increase in acreage of legumes, the use of legume seed better adapted to New York conditions, the use of lime as a means to secure a larger yield of legumes, and the utilization of the high-protein legume roughage to keep down the feed bill. In addition, emphasis has been placed on the conservation and adequate utilization of the farm-produced manure; on economy in fertilizer practice through the use of acid phosphate where it will suffice, or, if that is impracticable, through the home-mixing of fertilizer or the purchase of high-analysis mixtures only; on economic practices in silage, forage-crop, and small-grain production; and on the employment of conservative methods in the management and improvement of permanent pastures.

The normal amount of winter teaching has been done through regularly scheduled extension schools, community meetings, and farmers' institutes. The specialists devoted 169 days, and the seasonal workers 92 days, to winter meetings, which were attended by 7166 farmers. During the summer months various field demonstrations were conducted in cooperation with county agents. The demonstrations covered all the sub-projects emphasized during the year, and were fairly well distributed throughout the State. The specialists held 129 demonstrations which were attended by 1165 farmers.

The office activities have consisted largely of furnishing information to farmers relative to meeting their soil and crop problems. A total of 3450 letters were written, and 490 soil samples were examined and recommendations made for future treatment. A regular monthly publicity service has been maintained for the farm bureau news of the various counties. In this service the specialists prepared 60 articles, covering 115 pages. Eight articles, totaling 21 pages, were written for the farm press, and 125 notes dealing with soil and crop problems were prepared for publication.

As summarized, the extension work of the department for the past year included 267 lectures attended by 7618 persons, 30 conferences, 343 farm visits, 122 demonstration meetings, 14 days at fairs, the inspection of 77 demonstrations, 7 method demonstrations with an attendance of 51, the writing of 80 articles, 3450 letters, and 13 circular letters, and the examination of 490 soil samples. These activities have resulted in many changed practices leading to economy in crop production in the State. It has been conservatively estimated, for example, that 200 farmers have seeded alfalfa in accordance with recommendations. In Ontario County alone 25 farmers are cooperating with the department through their county farm bureau in methods of alfalfa production. Four cooperators in Oswego County are improving 50 acres of pasture in accordance with recommendations. One cooperator in Orleans County is improving 30 acres of permanent pasture, and another is seeding 20 acres to sweet clover for pasture. In Seneca County a farmer, in cooperation with his neighbors, has been induced to use a 30-ton car of bulk acid phosphate. He is also improving his 50-acre pasture. In Steuben County a farmer is following the department's fertilizer recommendations, and estimates that by home-mixing he saves more than ten dollars a ton on his potato fertilizer. The total number of farmers influenced in their liming and fertilizer practices by the department's extension teaching during the year would number well into the hundreds.

In addition to the foregoing extension activities, mention should be made of the analytical work formerly under the auspices of the Department of Agricultural Chemistry. The Department of Agronomy has conducted this work in accordance with the policy of the College of Agriculture to do testing and analysis only in so far as it directly benefits agriculture. During the past fiscal year this work consisted of the analysis of 16 samples of soils and limestones, and the answering of 107 letters.

Animal Husbandry

The year's extension work of the Department of Animal Husbandry has been conducted by five regular specialists, who were assisted, during the season of heavy demands for meetings, by an additional worker. There were two special projects inaugurated and completed during the year. The coming of the National Dairy Show to Syracuse in October, 1923, made it necessary for the department to prepare materials for a part of the state exhibit. Several weeks were devoted also to the training of judging and demonstration teams in the several counties, for competition at the exposition. In April, 1924, the department cooperated with several other agencies in arranging the dairy demonstration exhibit carried over the New York Central Railroad. The cars were equipped to feature economy in milk production. Fifteen demonstrations and seven lectures were given, with a total attendance of 3793.

For several years the county agricultural agents have been supplied each month with prices on concentrated feeds and suggestions as to suitable mixtures, for publication in the farm bureau news. This feature has been revised recently, and a new service added in the form of a monthly feed service letter, phrased in a personal manner and covering feed prices and suitable mixtures, making reference to timely practices in the proper management of the herd. This letter now goes to ten counties, where it is sent by the county agents to a special list of dairymen who have asked for the service.

The enrollments and effectiveness of the farm study courses have improved during the year. The course in milk production now has an enrollment of 42. The course in sheep and wool production, recently offered, has an enrollment of 32, and the course in swine production, also recent, has 7. During the year 644 reports or lessons on these courses were received and graded.

In continuation of an established practice, 24 short articles were prepared for the farm bureau news service. These articles have appeared 264 different times.

During the year eleven dairy-improvement associations have been discontinued and ten new ones organized, making a total on June 30, 1924, of twenty-six active associations in twenty-two counties. The two main problems for such associations are, first, the securing of reliable and efficient testers, and second, the arousing of interest in enough dairymen to form a full association. To a certain extent this latter difficulty is overcome through dairy-improvement clubs, of which there are twelve in the State. In several counties the high-school teachers of agriculture are assisting with club records.

Eighteen lectures were given during the year, with a total attendance of 656, and 1725 letters and 24 circular letters were sent out, with a circulation of 1304. In addition, 189 herd record books were summarized and returned to the owners. These books contained the records of 2827 cows, for each of which an individual-cow record strip was made out and forwarded to the Dairy Division of the United States Department of Agriculture. There were sent also 952 herd record books and 194 barn folders for dairy-improvement clubs. A news letter, containing the reports of the associations, was issued each month.

In the nature of the case, the work in disease control is proceeding slowly. Assistance to herd owners through county agents and accredited-herd associations is furnished by means of local meetings to discuss disease-control problems. So far as accredited-herd work is concerned, major attention has been given to sanitary practices in cleaning up infected premises. In view of the fact that there are other losses which probably exceed in amount those due to tuberculosis, an effort has been made to interest herd owners in herd health records. These are so arranged as to bring out the effects of irregularity in breeding, and to indicate the causes of loss. Livestock owners are so accustomed to losses that they are slow to appreciate how much may be done by them to check the inroads of accident and disease.

The outlook for sheep husbandry is good. Fortunately, no organized effort is under way to start a boom. The state wool pool is still functioning efficiently, and consignment by growers is general. Because of a growing interest in the feeder-lamb business of western New York, some extensive observations by the sheep specialist were made during April and May at farms where lambs were being fed. These visits were for conference on methods and to obtain facts on the profit or loss in the business. This information, if possible, will be made available to feeders next winter. The response to the work of the sheep specialist during the year has been satisfactory.

While records of activities may mean but little of themselves, they serve as one sort of measuring stick for comparison of the work year by year. With one less specialist than a year ago, there have been in the past year a few more demonstrations, lectures, and farm visits. Also, more days were spent in the field. Fewer articles were prepared, and there was a slight decline in conferences, largely because the spring conference of county agricultural agents was not held. These facts tend to emphasize the inevitable shift toward audiences that are better selected and therefore smaller. There were 160 demonstrations with an attendance of 4395; 320 lectures with an attendance of 8228; 41 conferences with an attendance of 177; and 402 farm visits with approximately 804 contacts. Members of the animal husbandry staff spent 521 days in the field, wrote 24 articles comprising 59 pages, sent 29 circular letters to 1619 persons, and wrote 8711 personal letters.

Results. Not only has the annual report form of the agricultural agent been improved as to the nature of the questions submitted, but this department has also sent out supplementary questions relative to projects which make the reports as a whole much more valuable. Attention was called to these supplementary forms in the report of the College a year ago.

The following tabulation has been gleaned from the annual reports of the county agents. In the main the figures are substantially correct, although the data on some points are obviously not complete. The data are submitted without comment or speculations. On the whole the summary represents a substantial achievement in the direction of better animals and better methods of production.

**RESULTS OF ANIMAL HUSBANDRY EXTENSION, AS REPORTED BY COUNTY
AGRICULTURAL AGENTS**

1. Adult result demonstrations.....	2,505
2. Adult result demonstrations completed.....	1,035
3. Animals involved in demonstrations.....	35,593
4. Total profit on animals reported.....	\$3,349
5. Total farms influenced.....	19,955
6. Total animals involved on above farms.....	180,436
7. Farms assisted to better sires.....	521
8. Purebred sires secured — bulls	433
9. Purebred sires secured — rams.....	33
10. Purebred sires secured — boars.....	15
11. Farms securing purebred females.....	324
12. Purebred females secured — cows.....	804
13. Purebred females secured — ewes.....	121
14. Purebred females secured — sows.....	11
15. Farms getting purebreds for first time.....	187
16. Farms culling herds.....	522
17. Breed clubs or associations organized.....	11
18. Members in breed clubs.....	290
19. Farms feeding better-balanced rations.....	2,671
20. Farms controlling insect pests.....	2,052
21. Dairy-improvement associations organized during the year.....	10
22. Dairy-improvement associations discontinued during the year.....	11
23. Total dairy-improvement associations now active.....	26
24. Cows under test a year ago.....	8,570
25. Cows under test now.....	7,511
26. Members in present associations.....	629
27. Farms not in associations but making tests.....	471
28. Cows discarded as result of testing.....	234
29. Members who have been in association more than one year.....	351
30. Inferior bulls in associations replaced by purebreds.....	14
31. Members purchasing purebred cows.....	11
32. Total purebred cows purchased.....	8
33. Dairy-improvement clubs active.....	1
34. Membership in dairy-improvement clubs.....	10
35. Cows discarded by dairy-improvement clubs.....	1
36. Milk-weight sheets distributed to farmers.....	6,56
37. Ewe flocks culled before breeding.....	
38. Ewes discarded	33
39. Rams discarded	2
40. Rams selected to head flocks.....	1
41. Lambs docked	90
42. Lambs castrated	54
43. Sheep treated for stomach worms.....	20
44. Barns where light or ventilation has been improved.....	17
45. Stables where more sanitary watering has been adopted.....	1
46. Barns thoroughly disinfected and whitewashed.....	1,99
47. Farms where skimmilk is pasteurized for calves.....	9
48. Farms where young stock are separated from mature animals.....	3
49. Demonstrations or trials in feeding legume hays.....	1
50. Approximate tons of hay fed during year — clover.....	1
51. Approximate tons of hay fed during year — alfalfa.....	
52. New silos erected.....	
53. Additional tons of silage stored.....	3.4
54. Cooperators favoring immature corn.....	
55. Cooperators favoring mature corn.....	
56. Cooperators favoring sunflowers.....	
57. Cooperators favoring soybeans.....	
58. Cooperators reporting gains in production.....	
59. Cooperators reporting increased economy in production.....	

60. Cooperative bull associations reported.....	4
61. Inferior bulls displaced by members of bull associations.....	16
62. Cows available to association-owned sires.....	475
63. Bulls owned in partnership.....	6
64. Townships covered by livestock survey.....	8

Botany

The number of cultures for the inoculation of leguminous crops sent out by the Department of Botany has steadily increased and now is well over 10,000 a year. More than 1000 letters have been written this year in connection with this work. About 200 weed and plant identification letters have been answered. A weed exhibit was staged at Farmers' Week, as was also an exhibit of legume cultures.

Dairy Industry

The chief extension activities of the Department of Dairy Industry have been in the field of market milk, but much work has also been done among the cheese manufacturers, and to a lesser degree among the makers of ice cream and butter.

Considerable effort has been spent in carrying to the farmer information regarding the factors that determine milk quality. Little or no progress can be made in improving milk supplies if the extension work is confined to the producer, because many of the major problems are found, not on the farm, but after the milk has left the farm. For this reason the department began, in this past year, to work cooperatively with local health departments and with the managers of dairy plants. The work has consisted largely in making surveys of the quality of milk being delivered, and in following this with personal visits to those farms from which milk of inferior quality is being procured. In work of this character there come to light many problems which demand thorough study before definite conclusions can be reached. This emphasizes the importance of coordinating extension and research work.

Entomology

Extension work in the control of insect pests has been conducted in general, by the Department of Entomology, along the same lines as in recent years. The most important phase of this work is the spray-information service conducted in cooperation with the Department of Plant Pathology, described on page 80. The supervision of this work occupies most of the time of the specialists during the summer months. In addition to the spray-information service, extensive correspondence is conducted with individual growers, and instruction is given in extension schools, at farmers' meetings, and on fruit and potato tours.

In order to be able to give sound advice as to the importance of sowing wheat at the proper time, an examination of wheat fields is made just before harvest time each year in order to determine the percentage of infestation by the hessian fly. The results of this examination are sent to the wheat-growing counties so as to be available before planting time, and the farmers can time their sowing accordingly.

The extension work in ornithology and mammalogy in the past year included the giving of 10 out-of-town lectures and 5 local lectures and demonstrations, and the writing of about 200 letters.

Beekeeping. There are thirty-six associations of beekeepers in New York State, nearly all of which call upon the college extension specialists to attend meetings at least twice a year. The number of teaching contacts for the specialist are therefore in direct proportion to the size of membership in these associations. One of the thirty-six associations is a state federation of the locals, and this federation has grown about 30 per cent during the year. Another association is the Empire State Honey Marketing Cooperative Association, Inc., which thus far has not functioned in the sale of honey. This association made an exhibit of honey at the Eastern Apple and Fruit Show, and at present has a three-years contract with a marketing service.

During the summer of 1923 and the spring of 1924, 27 method demonstrations were conducted in sixteen counties, with an attendance of 1287. In addition, 60 lectures were given before audiences totaling 1483, in twenty-six counties. The specialist also attended 45 conferences with 170 persons, made 9 special visits to beekeepers at their apiaries, prepared 14 articles for the press, sent 18 circular letters to 1542 persons, and wrote 1373 personal letters.

An effective method of teaching was developed at summer picnics of beekeepers by means of contests. The first was a smoker contest, to see who, in a given time, could make the best use of his smoker; the next was a written quiz on general beekeeping questions; the third was a "What would you do?" contest, in which five colonies of bees were marked to be examined by contestants who later wrote down what they would do with each colony; and the fourth was a honey-grading contest. Prizes of subscriptions to bee journals, books, queen bees, smokers, and other articles, were awarded, and apparently the lessons were well learned.

Floriculture and Ornamental Horticulture

The extension work of the Department of Floriculture and Ornamental Horticulture has followed the same purpose and method as in the preceding year. The close of the second season of this policy indicates clearly the increasing popularity of and the growing demand for education and assistance in matters pertaining to civic and rural improvement work.

The major problem now faced is that of handling the work that has already been started. Organized improvement campaigns are being conducted in five counties. Four additional counties asking for this service have been compelled to wait indefinitely, as the specialist available cannot take on more work. Calls for assistance are increasing steadily, and so, again this year as last, many individuals and communities have been disappointed because of the inability of the department to accede to all requests. At the time of writing this report, every available date during the fall season of 1924 and the spring of 1925 has been filled, and in addition twelve definite requests have been refused.

Once again a marked increase in results is indicated. Work was conducted in twenty-four counties during a total of 152 days in the field.

The number of lectures increased from 59 in 1923 to 100 in 1924, and the attendance from 3554 to 7080. Demonstrations increased from 5 to 46, and the attendance from 103 to 1273. Personal contacts increased from 4204 to 8721.

Forestry

The especial features of the extension work of the Department of Forestry during the past year have been in connection with the state-wide campaign for reforestation, and the continuation of the other extension work of the department. Close and cordial relations have been maintained with the New York State Conservation Commission. Cooperation with the farm bureaus has increased. In the spring of 1924 the members of the departmental staff held themselves ready to respond to calls for assistance in tree-planting demonstration work, but it is of significance to note that this activity has now become so well organized that the major part of it was handled, as it should be, by the local farm bureaus themselves. Nevertheless the department, by conferences and correspondence, played an active part in the preparations for the tree-planting work of the spring.

The total number of trees reported as planted in 1922-23 was 400,742, by 317 demonstrators in forty-three counties. However, this is not a complete record, as there were some localities from which no reports were received. In 1923-24 the number of trees set out was 633,350, by 429 demonstrators in forty-seven counties.

The extension work of the department has included demonstrations, lectures and talks, conferences with county agents and others, and a large amount of correspondence in reply to questions of all sorts relating to forests and forestry. Particularly successful was a demonstration of proper cutting methods, held in Westchester County in October, 1923. Counts and measurements in forest plantations established during the past few years have also formed a part of the work of members of the departmental staff this year.

As usual, the department had an exhibit at the State Fair in Syracuse in September, 1923. Although modest in design, this exhibit attracted interest and furnished opportunity for persons desiring to do so to come into contact with the department. It is the belief of the extension members of the forestry staff, from their contacts with the county agents, that the progress of a better understanding of forestry throughout the State during the past year has been satisfactory, both in regard to the reforestation activities and in connection with other forestry work. This has made itself evident in the growing demand for the type of service that the College is prepared to render through its extension workers in forestry.

Home Economics

In the extension work of the Department of Home Economics, progress has been made during the past year in the early planning of county programs. Temporary plans for the year's work in the communities were made by July, and the plans were completed during the summer. This enabled the local groups to undertake their projects in September or October. Better discussion and expression of needs on the part of the local people have been evident at the program-planning meetings, which

seems to indicate that the work with local leaders is developing self-help not only in solving problems but also in discovering them.

The greatest problems at present in the county and state work are of an administrative nature, caused by the small state force upon which the large field organization has to draw. More specialists are greatly needed if a high standard of teaching is to be maintained in the counties. Providing simpler programs in the counties would be one feasible way of meeting the situation. This would help to decrease the administrative work of the county and state leaders, and to leave more time free for good teaching, necessary supervision, and home visits.

Food preservation and preparation. Work in food preservation was conducted during the past year in twenty-one counties and one city. Twelve county leaders were trained, and there was a spread of influence to 987 women not formerly cooperating in the project, with a total of 7324 practices changed. The work included methods of canning fruit, vegetables and their combinations, and meats, and the principles to be followed in making jellies, jams, conserves, and candied fruits. There has been cooperation with home-bureau managers in supervision, with merchants in furnishing equipment, and with local schools in the use of homemaking laboratories.

The food-preparation work has been developed in twelve counties. It includes instruction in the fundamental principles of the preparation of milk and cheese dishes, fruits, vegetables, and whole wheat flour, and the stimulation of an increased use of these products through skill in their preparation. Milk campaigns were held in five counties. This work included 12 local-leader meetings, at which 369 local leaders were trained. The number of persons reached was 9872, and 10,540 practices were changed.

Efforts were made to improve premium lists and fair exhibits through community meetings, 18 demonstrations, 8 conferences with fair committees, the revision of 6 premium lists, and 6 judging demonstrations. In revising the premium lists in the ten counties concerned, it was possible to eliminate many undesirable articles, to increase the premiums, and to add articles that should be exhibited. In all the counties undertaking this work there resulted an improved quality of the exhibit and a manifestation of higher standards.

When a food-preservation project is completed prior to the holding of a county fair, each group has a community exhibit where each person taking this work shows her best example of food preservation. The winners of first-prize ribbons are eligible to exhibit at the county fair and the others are eliminated, thus avoiding the usual duplication at county fairs. Likewise, winners at the county fairs are eligible to exhibit at the State Fair.

In 1923, for the first time, home-bureau exhibits were given a place at the State Fair. Ten counties were offered space, each county being given \$200 to defray expenses. Preserved foods formed the background of each of these exhibits, and the fruits were later sent to the Eastern States Apple Show in New York City and exhibited as a part of the New York State exhibit.

Nutrition. The program of the nutrition project during the past year has been one of expansion of territory, and broadening and strengthening

of interest. In 1922-23, twenty-two counties and two cities cooperated on the nutrition project; in 1923-24, thirty-six counties and one city have been engaged in promoting it. The number of communities actively cooperating in these counties and cities has increased from 269 to 409. Special emphasis has been placed on reaching persons outside the home-bureau membership, and in this the workers have been particularly successful. There is a rapidly growing interest in community dinners and school lunches. In almost every county there are reports of a better food supply in the local stores throughout the year. A keener interest and a more progressive attitude have been shown this year toward nutrition as a human problem than ever before. The nutrition project is being appreciated as signifying something more than mere meal planning, and the importance of proper food habits is being better understood and accepted.

The elementary series of discussions on food selection, including a study of the score card, meal planning, classification of foods, food values, and what and how much to plant in the garden and preserve for winter use, has been undertaken by 284 communities this year. The advanced work, which had included discussions of the simple ailments of the alimentary tract and a study of meal planning for special conditions, has been carried on by 155 communities. Six lectures have been given on pre- and post-natal feeding and infant feeding, as a means of arousing interest in the relation of feeding to structure. The most intensive development of the nutrition project was the work done in Cattaraugus County, where the entire county cooperated.

The nutrition specialists cooperated with the county farm and home bureaus and the United States Department of Agriculture in a demonstration milk campaign in Madison County. In this they had the support of a number of local organizations. The aims of the campaign were to reduce malnutrition in children and to increase the use of milk. Exhibits, lectures, moving pictures, posters, essays, newspaper articles, and placards were used throughout the county.

The home study course in feeding the family received a decided impetus during the past year, due to the fact that 101 of the local leaders in nutrition completed it. In addition to the local leaders, 250 homemakers began the course this year, and there were 153 students held over from the preceding year. Of the total number enrolled, 39 have graduated and 155 have been dropped. The enrollment at present includes 209 active students. The 39 graduates report that 52 persons in their families have changed 126 practices as a result of the study.

This year, as a result of requests from a number of counties, the directions for relieving constipation, underweight, and overweight, and for feeding during pregnancy, infancy, and childhood, have been given to all who wished to receive them. The records show that this material was distributed to 2898 persons, with successful results reported in 587 cases.

Almost three times as many child-feeding demonstrations were reported this year as last. Eighteen pregnant mothers were interested in the feeding problem, and several have already reported excellent results.

The food-selection score-card demonstration was made by 859 families representing 2818 persons, 1080 of whom were children. In connection with the score-card demonstration, a study was made of the quantities of

eggs, cheese, and meat consumed weekly. Of the total of 2818 persons scoring, 1057 reported using meat about 7 times a week. This was reduced to an average of 6.4 times at the end of the year. There were 832 persons who reported using cheese an average of 2.7 times a week at the beginning and 3 times a week at the end of the year. Eggs were used by 982 persons, the average number used being 7 eggs a week in the fall and 7.4 eggs a week in the winter and spring.

Summarizing, 409 communities received intensive nutrition service during the year. In these communities 1937 meetings were held, with an aggregate attendance of 19,397. There were in addition 15,439 personal conferences. School lunches have been promoted in 18 communities. In 63 communities, reports show that the stores are providing a better selection of fresh foods and whole cereals, and in 8 communities the bakeries are making better bread. In 8 communities the food sold in public eating places has improved. Personal letters have been written to those who had dietary problems which could not be solved successfully by means of general directions.

The experience of the past three years in promoting the nutrition project has shown that local leaders are particularly successful in developing a progressive attitude in the community toward nutrition as a vital human problem. They have been effective also in distributing information that has led to an intelligent practice of good food selection. Not only this, but comparative results have shown that local leaders are more effective than specialists or agents in accomplishing these results in the community.

Clothing. The clothing project work for 1923-24, though differing somewhat both in content and in organization from the work previously developed, has in a sense been a recapitulation of it. Due to the widespread interest in clothing throughout the State, the demands by women for help in the problems arising, and the inadequate amount of specialists' help available, most of the project work in communities during the past three years has been done by local leaders. An invaluable service has been rendered by these volunteer local assistants; many more persons have been reached, more work has been developed, and more of certain kinds of practices have been changed, than would otherwise have been possible. The aim for this year has been to strengthen work previously developed, rather than to undertake additional subprojects. The specialists this year have divided their time between (1) stimulating and assisting county and local leaders to repeat old projects for new cooperators, and (2) giving county-wide and district lecture demonstrations in each county on topics recapitulating the former work and relating it to the whole field of clothing the family.

Lecture demonstrations on four of the following topics have been given in each of twenty-nine counties and one city: the well-dressed woman; dress accessories; designing the clothes for the family; successful home-made clothing; a spring and summer wardrobe for 1924; how to buy ready-made clothing; the choice and use of commercial patterns. In connection with the lecture demonstrations, valuable cooperation was given by local stores, mail-order houses, and shoppers' service organizations, thus making it possible to give practical suggestions from the many differ-

ent angles. Reports indicate a keen appreciation on the part of the women, not only for the facts taught but also for the new outlook gained. In all, 116 lecture demonstrations were given by the clothing specialists, reaching directly 9816 women. Home demonstration agents in seven counties repeated one or more of the lecture demonstrations at 50 district meetings, reaching 2886 women.

Training meetings for local leaders have been conducted by the specialists this year in only two newly organized counties. However, an intensive training meeting for county leaders was held in September, 1923. Sixteen counties sent leaders for instruction and assistance in organizing, teaching, and supervising projects previously developed in the county, on which there was need for further work. At this training meeting the time was divided between a review of subject matter and teaching methods, a discussion of plans for organization, development, and supervision of project work, and the making of illustrative material. As a result of this intensive work, county leaders in the sixteen counties held 268 training meetings with a cumulative attendance of 64,856. The 496 leaders trained at these meetings in turn conducted 928 local meetings, attended by 10,907 cooperators, 1132 of whom reported an average of from six to ten changes in practice. Special projects on health in clothing, and on choice and construction of underwear, were organized and developed by the home demonstration agents in five counties in cooperation with the specialists. In one section of the State, five counties developed a project on the overblouse.

In addition to the foregoing, clothing specialists assisted county leaders at 27 training meetings, held 8 demonstration meetings and while in the field had 819 conferences with 2426 persons, observed the work of 8 county leaders, and held summary meetings in twenty-five counties reaching 866 women. The purpose of the summary meetings was to determine directly with the cooperators their reaction to the project, the problems which it helped them to solve, and the problems still remaining unsolved, and to make plans with them for work for the coming year. The total number of contacts by specialists during the year was 13,828.

House furnishing. During the past year, progress has been made in the development of the house-furnishing project. As second-year work there have been included in the program for several counties, training classes for local leaders. Many homes have been visited by the specialists for the purpose of bringing about changes of practice. The greatest hindrance to the progress of the work is lack of instructors. To give only two or three days out of one college year to each county, instead of consecutive months in the same district where it would be possible to follow up one lesson with another, necessarily makes for incomplete work. The demand for the specialists' time is always greater than can be met. In thirty counties, 84 meetings and 12 training schools were attended by 3550 persons. In all, 309 changes of practice were reported.

Junior homemaking. The junior homemaking work includes projects in: foods, nutrition, clothing, and food preservation, each extending over two years. The general aims of the work are to encourage a desirable attitude, improve skill, increase knowledge, and establish better habits, in

girls under twenty years of age in the home problems relating to food, shelter, and clothing. The specific aims in the foods and nutrition projects are to encourage interest in a better nutrition program, to establish better practices in preparing and serving foods, and to bring about an appreciation of time and money values in selecting and preparing foods. The aims of the clothing project are to promote better judgment in the selection of clothing materials and of ready-made garments, and to encourage the choice of simple designs and construction processes which will carry over from one garment to another and from one season to another. The most important aims of the food-preservation project are to encourage the planting of more and better home gardens on the budget basis, the use of the score card to measure standards in diet, and the adoption of improved practices in the use of vegetables and fruits.

All homemaking project work this year has been carried on by the local-leader method. The number of local leaders in proportion to workers has increased, their attendance has been better, and they have shown more evidence of appreciation of all the problems suggested in the requirements of a project. There has been better cooperation in junior work in the College and in the field. During the year, time equivalent to that of two specialists for eight months has been devoted to the junior work. There have been 139 days spent in the field, 25 days in special meetings and conferences, 191 days in the office, and 61 days *en route*. The field work has included 71 county visits and 23 demonstration meetings, with an attendance of 971; 216 training meetings, with an attendance of 2847; 13 method demonstrations, with an attendance of 66; 54 conferences, attended by 253 persons; and 2 lectures, with an attendance of 250. In the office 53 articles containing instruction material have been prepared, 56 circular letters have been sent, and 621 other letters. Since 1919 the number of local leaders has increased from 248 to 1405.

Requests for bulletins and information. The routine of the requests for bulletins has been slightly simplified, with a resulting saving, not only of labor, but also of time in reply. There have been an average of 282 bulletin requests each month from residents of New York State and 133 from outside the State, in addition to an average of 8 persons requesting more than 15 copies of any one bulletin. The letters from other parts of the world are interesting in their requests for information and advice. In one week there were such requests from British South Africa, Chile, New Zealand, and Canada. The mailing list for bulletins now numbers 6071.

Meteorology

The extension work of the Department of Meteorology during the year was concerned with three main projects: spray-service weather forecasts in the interests of fruit growers; harvest-weather forecasts in the interests of the general farmer; and cooperation with the New York State Conservation Commission in the control of the spread of the gypsy moth in the State.

The services in forecasting spray and harvest weather, offered in cooperation with the United States Weather Bureau, were rendered during the year much as heretofore. It is gratifying to be able to report that after some five years of work on these projects their value to agriculture is now

fully recognized, and that a fund has been provided by Congress, to be administered by the Weather Bureau, for the support of these projects for the fiscal year beginning on July 1, 1924. The fund provided is about \$10,000, and will be used mostly in New York State. In other States the necessary preliminary work has not yet been done. Anticipating favorable action on this measure, plans were made early in April for a considerable expansion of the harvest-weather forecast service, to begin on July 1, 1924. The county farm and home bureaus are cooperating efficiently, and it is estimated that on July 1 and every day thereafter, except Sunday, until August 30, the harvest-weather forecasts will be available to approximately 50,000 farmers in the State within two hours after they have left the hands of the forecaster at the Weather Bureau office at the College of Agriculture.

No attempt has ever been made heretofore to distribute weather forecasts to farmers, nor indeed to any other special industry, on such a scale. This has been made possible, first, through the funds supplied and the encouragement offered by the College of Agriculture throughout the experimental stage, and secondly, by the effective and enthusiastic cooperation of the county farm and home bureaus. The service will be followed closely during the season, first-hand information as to its value obtained, and a comprehensive report prepared at the end of the season.

Plant Breeding

The extension work of the Department of Plant Breeding has been developed as an effort to arouse interest in and wide use of the best strains and varieties of grain and grass crops. By means of a well-organized inspection service, adequate supplies of seed have been made available. Through community meetings, field demonstrations, extension bulletins, news articles, and exhibits at Farmers' Week and at fairs, much interest has been aroused in these recommended strains, and throughout the State they are receiving wide acceptance.

The demonstration of the superiority of domestic over foreign-grown clover has largely eliminated the latter from the seed trade in this State. In 1923 demonstration plots were sown in twenty-eight counties, and the publicity given to these has largely increased the demand for domestic seed.

In furthering the better-seed program the extension force of the department is working in close cooperation with the New York Cooperative Seed Improvement Association. The policy of the College governing the inspection of seeds and of crops grown for propagative purposes during 1924 has been announced as follows:

The inspection of seeds and of crops grown for propagative purposes for seed growers, as a basis for certification for commercial purposes, shall be made through the New York Cooperative Seed Improvement Association, Inc. Any individual, contract seed grower, or seed firm in the State desiring inspection must be eligible to membership in this Association upon compliance with the rules and regulations of the Association, which rules and regulations are subject to the approval of the Dean of the State College of Agriculture.

Through this association the members of the department inspect growers' fields before harvest. This is followed by a second inspection of

threshed grain intended for seed purposes. The history of each lot of seed is thus known and its value as seed is determined. Only recommended varieties receive this inspection. Lists of recommended growers are published and made available to consumers of seed. During 1923 such inspection service was rendered to 185 growers of corn, oats, barley, wheat, rye, buckwheat, and soybeans, embracing a total of 1896 acres. In addition, assistance was rendered to twelve growers of seed potatoes. These men are attempting to develop higher-yielding strains of potatoes, and the extension representative has worked with the growers showing them how to make selections and conduct strain tests.

By means of demonstrations and plot tests, the department is determining the types of silage corn best adapted to the different localities in New York. The establishment of adequate seed sources, and the inspection of these with subsequent recommendation of the best sources, has materially altered the types and varieties used throughout the dairy sections of the State.

Seed sources of several new strains of timothy are now being established, and it is hoped that material improvement in the yields of this important hay crop may result.

Plant Pathology

In the extension work of the Department of Plant Pathology, emphasis is placed on the control of diseases of fruits and potatoes. These crops are of great importance in the State, and diseases occurring on them, unless controlled, are capable of causing large losses. Other crop diseases are receiving such attention as the department is able to give.

Potato-improvement work consists in seed treatment, soil treatment to prevent scab, spraying and dusting, maintaining seed plots, and testing sources and strains of seeds; in talks at field meetings and on tours, at community meetings, and at extension schools; in transmitting information by means of printed leaflets, news items, and correspondence; and in maintaining a seed-potato inspection service.

Practically all seed-potato growers now treat seed tubers before planting them. Information in regard to the corrosive-sublimate method has become well established. The newer hot-corrosive-sublimate method is being used where there are large quantities of potatoes to be treated. One man makes a business of treating by this method, and in one season he treated about 21,000 bushels in three counties of western New York, charging ten cents a bushel. A prominent seed firm in western New York treated about 8000 bushels by this method. By testing the strength of the solution with potassium iodide, it is possible to maintain the solution at standard strength while the treatment is in process. The earlier recommendation was to renew the entire solution after each third treatment, a procedure which is impracticable when the hot method is used. This process of testing the solution also expedites the cold-treatment method, and instructions for making the test are being rapidly extended to all growers who treat their seed.

The use of sulfur applied to the soil as a method of control for potato scab was demonstrated in seven tests on Long Island this year. The acid

condition of the soil produced by sulfur has a detrimental effect on the growth of most agricultural plants, and demonstrations showing this ill effect have been arranged on the sulfured plots of previous years. Up-state growers who practice a rotation of crops are being urged to use caution in the application of sulfur.

Potato-spraying or -dusting demonstrations are being conducted in Cassau County, where 21 such demonstrations have been provided, and in Montaga County, where spray-rings involving 30 growers have been organized. Three news letters in regard to spraying and the preparation of bordeaux mixture have been published.

Efforts to demonstrate the value of high-grade seed potatoes are being continued. In eighteen counties this year, 52 variety or strain tests were conducted in cooperation with the Department of Vegetable Gardening. At field meetings and on tours, emphasis is being placed on the value of using good seed and the method of producing it. Fourteen tours in eleven counties, and twenty-two field meetings in six counties, were held during the past year, and fifteen counties have made request for similar work. In following up the program for the production of good seed, the College is offering to give instruction to growers in roguing seed plots, and requests have been received from ten counties for such work.

The Department continued to conduct a potato-inspection service for associations of growers and contract growers. This inspection covered 544 acres, in twenty-four counties, with a yield of 231,906 bushels of seed which passed all three inspections. All expenses connected with the inspection work, except supervision, were borne by the agencies applying for it. The fields passing inspection yielded at the rate of 207 bushels to the acre, as compared with the average yield for the State of 122 bushels to the acre. The average yield to the acre for the State has been increasing year by year, so that for the first time since records of yields have been kept there has been an average yield for five consecutive years of more than one hundred bushels to the acre. The increased use of high-grade seed is undoubtedly been an important factor in these results.

Onion growers are now well informed regarding the method of treatment for smut, and for the most part are practicing it. The county agent of Orange County states that about 90 per cent of the growers in that county will use formaldehyde the coming year. A few years ago no formaldehyde was used there. An educational campaign has been conducted in that county by a special field assistant for five years, from 1918 to 1922 inclusive, and this work, combined with the efforts of the county agent during and since that time, has led to the general adoption of the control method, which means a great saving to onion growers.

As a result of demonstrations and seed testing done by this department, the cabbage-seed producers furnishing most of the seed used in the State have treated all that they have put on the market this year. Extension work on the control of cauliflower diseases is being started. An attempt is being made, through field meetings, to interest the vegetable growers in disease-control methods.

Two years ago a survey of the tobacco district of Chemung County was made, to determine the extent of the wildfire disease. One year ago work

was undertaken to control this disease by seed treatment, seedbed disinfection, and spraying or dusting. As a result of the experience of that year, it was suggested that the seed be sown directly in the seedbed instead of germinated seed being sown, which is the usual practice and which results in decreased germination. This suggested method has been practiced this year by a few growers with very gratifying results. Spraying or dusting of the plants in the seedbed is being advised and is practiced to a considerable extent.

Bean inspection was extended during the year to eight growers in Wayne County, for the purpose of locating suitable seed. In the future such inspections will be handled on the same basis as is potato inspection in which the growers pay for the service.

Oat-smut control by the use of dusts, while giving fairly good results was not superior to the dry-formaldehyde method and so will be discontinued. The control of wheat and barley smuts, and of other diseases of these crops, was demonstrated in six counties.

A plant-disease survey was conducted, with the help of all members of the departmental staff and other departments and agencies in the State. Nearly 3000 reports were submitted on 800 diseases of wild and cultivated plants. In the case of economic plants the geographic range was reported, the percentage of loss was estimated, varietal susceptibility was recorded and other points of interest were noted that are of value in determining an extension program. A special cereal-disease survey was made during June, July, and August, which was extended to thirty-five counties. During these surveys contacts were made with many growers who became interested in the diseases and control methods. Such surveys should be made from year to year as time and means will permit.

In addition to the field work conducted by members of the extension staff, including field assistants, other members of the departmental staff have assisted. The three industrial fellows who are in the field have assisted materially in the localities in which they are stationed.

During the winter and spring, lessons or talks have been given at extension schools, community meetings, and other meetings of farmers. The correspondence of the department is especially time-consuming, since specimens of diseased plants received must be examined. The following is a summary of the extension work from June 1, 1923, to May 31, 1924, exclusive of the work of the field assistants: 66 conferences, attendance 246; 78 lectures, attendance 1814; 9 method demonstrations, attendance 829; 25 result demonstrations, attendance 10; 1 demonstration meeting, attendance 8; 20 field tours, attendance 1876; 234 farm visits; 51 variety-test inspections; 41 demonstration-plot inspections; and 4 miscellaneous days.

Three circular letters were sent to 170 persons, 67,898 leaflets were sent out, 3059 letters were written, and 32 news articles were prepared.

Pomology

The end sought in the extension work of the Department of Pomology is a stabilized fruit industry based on increased efficiency and economy in production and marketing. This necessitates that attention be directed to

all phases of fruit growing, but it is deemed especially important to acquaint the grower in an understandable way with the underlying principles. Emphasis has been placed, in extension schools and through press articles, on the importance of acquainting the growers with the general outlook for fruit growing. It is felt that a lack of knowledge regarding the status of the fruit industry in competing sections, and a failure to properly interpret statistics, have resulted in "misfit orcharding," and it is believed that a better understanding of the condition will tend to avoid excessive fluctuation in the industry.

There continues to be a very keen demand among the fruit growers for information as to the newer scientific discoveries that have a definite bearing on economical production. The teaching in regard to these discoveries has received major emphasis during the past year. Information concerning the problems related to the practice of pruning is still in great demand. This work is handled mainly in long-time demonstrations, and the interest not only is sustained but seems to increase from year to year. There are now 61 such result demonstrations, the majority of which involve pruning. Other long-time demonstrations deal with the fertilization of orchard and small fruits, and with other phases of soil management.

The correspondence courses in fruit growing are demanding more and more attention from the extension workers. Many of those enrolled in the advanced course have had considerable experience in fruit growing. They have been taking correspondence work at the suggestion of the county agents and as a result of the contacts at extension schools and field meetings. Unfortunately, with the help available it is not always possible to answer as promptly as seems desirable the reports and lessons which are submitted. The help of an assistant would be highly desirable to go over some of the routine matters, leaving the specialists to give attention to the more advanced and intricate lessons.

Poultry Husbandry

The purpose of the extension work of the Department of Poultry Husbandry is to increase efficiency in the production and marketing of poultry products. The breed-improvement program deals with those phases by which production is brought to a high level of efficiency. Breeding continues to be the important phase of improvement. The culling of poor producers represents one of the first steps, and is accomplished in two ways. The first of these is demonstrations in which interested persons are taught how to recognize the good and the poor producers by means of physical examination. Although these culling demonstrations have been conducted for many years, they still maintain their popularity. There were 192 such demonstrations held in thirty-two counties during the past year, with 3471 persons in attendance. The second means of culling poor producers from a flock is the cooperative employment of men, recommended by the College, by flock owners who want an expert to do this work. The College trains and schedules the men, and the entire cost of the service is paid for by the persons who use it. Last summer these expert cullers worked in twenty-nine counties and handled 198,547 birds in 1035 flocks, from which 29.1 per cent of the birds were eliminated as poor producers.

A further step in breeding is the selection of the best birds for breeders. This year the number of birds certified was 36,388, on 247 farms in forty-nine counties. Responsibility for certification is wholly carried by the New York State Cooperative Certification Association, Inc., which pays the full costs of examination, banding, and necessary records.

The resident-poultry-extension-specialist farm-management project includes two regions, Long Island and the Hudson Valley. Each of these two regions has the continuous service of a resident representative of the College, who visits each of the seventy to eighty cooperators from six to eight times a year. The flock owners receiving the service pay most of the costs.

There is an increasing demand for extension work in marketing, diseases, cost accounting, and management, and for junior project work. There are 233 persons enrolled in the Farm Study Course in poultry, and 179 in the Advanced Reading Series.

In December, 1923, the Second Annual New York State Production Poultry and Egg Show was held at the College. The interest shown in this event was even greater than in the preceding year. More than 1000 birds were exhibited. Illustrated lectures on breeding, and demonstrational judging, were features of the show.

Rural Education

At the suggestion of some of the district superintendents of schools, two correspondence courses were conducted by the Department of Rural Education during the past year. One of these dealt with the principles and practice of rural-school administration, and the other with the use of standardized achievement tests. The interest in this work certainly warrants its continuance.

Cornell Rural School Leaflets have been distributed during the year as follows: Teachers' number, September, 23,000; children's numbers: November, 135,000; January, 120,000; March, 120,000. The supply of the Leaflets has not been equal to the demand for them. The printing fund will not allow larger editions without serious reduction in the size of the Leaflet.

Rural Engineering

The varied activities of the Department of Rural Engineering in its extension work have been continued unabated. As usual, two extra men were employed to assist in conducting extension schools during the mid-winter months. In addition to these, three regular extension men and six other members of the staff were in the field on extension work.

Assistance in drainage is still very much in demand, large projects being rather on the increase. In one case a ditch 8 miles long, to drain 32 farms, was laid out, at places in water nearly waist-deep. This ditch has been constructed, and land that was under 3 feet of water was fit to plow this spring in spite of the wet weather.

The sewing-machine schools continue to increase in popularity, the demand far exceeding the ability of the department to supply. The older types of schools on gas engines, tractors, belt lacing, rope work, harness repair, soldering, saw filing, and the farm shop generally, are in constant demand.

Continual and painstaking effort is being expended to render the extension work in dairy-house construction, cow-barn ventilation and construction, and general layout and arrangement of farm buildings, more authoritative and effective. The demand for this type of help is steadily increasing.

A new activity, which gives promise of developing into one of the most important extension activities of the department, is the preparation of correspondence-course material and its use for carrying on the teaching begun in direct contact with junior project club members and high-school students. This work was begun in a small way during the past year, and in the time available for it is already assigned for the coming year, many requests having been of necessity denied.

During the year lantern slides and accompanying texts for illustrated lectures on drainage and on home water-supply have been prepared and added to the equipment of the office of the Director of Extension.

A conference of persons interested in the extension of rural electric lines was called by the department. At that conference it was voted that the head of the department should appoint a rural electric-line conference committee, of which he would serve as chairman. The other members of the committee are: S. L. Strivings, Master of the State Grange; Enos Lee, President of the State Farm Bureau Federation; Mrs. J. Roe Stevenson, representing the State Federation of Home Bureaus; and Burt R. Shephard, Chairman of the Rural Rates Committee of the Empire State Gas and Electric Association. It is hoped by these activities to promote the extension of rural electric power lines so that many farm homes may now derive the comfort, convenience, and profit to be derived from central-station current.

Rural Social Organization

The success and growth of the extension work of the Department of Rural Social Organization during the past year has been gratifying. Notable results have been achieved in the training schools in rural recreation and rural dramatics, which have been held in thirteen counties. At these schools, local leaders from farm and home bureaus, granges, churches, schools, or lodges, are assembled at a central place for a day's instruction, in which they actually participate and are trained in various games or in producing a play. Three or four sessions of one day each are held at intervals of about a month. At the later meetings of these schools, considerable evidence was produced to show that the instruction received had been put in practice in the local communities, and that those in attendance were assuming real leadership in the recreational life of their communities.

Two members of the extension staff were kept almost constantly in the field until the middle of May. In all, 232 days were spent in the field, and 192 demonstrations, 65 lectures and conferences, and 130 training meetings were held, with a total attendance at all these meetings of 15,387. The best evidence of success of this work is the fact that at the present time the extension office has requests from twenty-six home bureaus for work by this department for the coming year. Obviously it will be impossible to meet all of these requests. There is need for consultation work in the general field of community organization, and for giving advice with

regard to community buildings and community clubs, and in the development of county conferences on social organization and social work. Such work requires considerable time, and opportunity should be provided to meet the situation. It seems evident that the demands for extension work by this department will be larger than its staff will be able to meet, and the State's provision for it should be guided accordingly.

During Farmers' Week the second Conference of Grange Masters and Lecturers was held, with the cooperation of the officers of the State Grange, and during the spring the extension professor attended several of the district lecturers' conferences with the state lecturer. The subordinate granges afford opportunity for doing a certain type of extension work which cannot be accomplished otherwise. The local lecturers need assistance which they are now unable to obtain. Many of the local granges are strong financially and in membership, but are weak from a functional standpoint. The College could render a very large service by assisting the state lecturer in the preparation of helps for local lecturers and in holding training conferences. A full-time man should be added to the staff of this department to develop this line of work.

There was also held, during Farmers' Week, a very successful conference of rural pastors. This was the first successful conference of its sort which had been held for some years, and there were approximately 75 persons in attendance. The pastors were enthusiastic concerning the conference, and passed resolutions asking the College to repeat it and to hold a summer training school for rural pastors. Such a school, of two week duration, has been arranged for the summer of 1924.

Spray-information service

The spray-information service is being conducted this year, in one manner or another, in twenty-eight counties of the State. This means that information in regard to the proper applications of spray and dust for fruit and vegetables, as to both the time for the applications and the materials to be used, is being given regularly during the season to all farmers of these counties who desire it. Eighteen counties have services of special field assistants. There are thirteen of these assistants, and four of them each serve more than one county. One of these thirteen assistants is appointed by the State Department of Farms and Markets, and twelve are appointed by the New York State College of Agriculture. Three of the latter are county agents who are devoting the greater part of their time during the spraying season to this work. In ten counties where fruit growing is not of major importance, the county agent is sending spray information to the growers who desire it, and in three counties the growers are receiving a mail service from the field assistant located in an adjoining county.

Supervision of the spray-information service, by specialists from the Departments of Entomology and Plant Pathology at the State College of Agriculture, is available to the field assistants and county agents who are conducting the service. This supervision consists of visits to the field men, of continued correspondence with them, of checking their weekly reports, and of timely articles sent to them in the weekly news letter which contains also the weekly reports of all the field men. The United States

Weather Bureau is cooperating in sending a special forecast each night during April, May, and June to the counties conducting the service. From these forecasts, from information obtained from their leaders, and from observations made of the development of the plants, insects, and disease-producing organisms, the field men come to a decision as to the time to make applications and the material to be used. Their recommendations are sent by mail, and by telephone when necessary, in time to give the growers an opportunity to make the needed applications. Many farm visits are made by the field assistants to see how their recommendations are being followed. Demonstration orchards, to which all recommended applications are made under the immediate supervision of the assistants, serve as checks on the service. In this manner the fruit interests of the State are fairly well covered, so far as concerns the receiving, as it is needed, of the available information regarding the control of diseases and insect pests.

The eleven field assistants serving in the 1923 season spent 1007 days in the field and 189 days in their offices, made 5210 visits, conducted 232 demonstrations at which 5576 contacts were made, prepared 218 circular letters having a circulation of 56,592, wrote 1151 other letters, and published 148 articles in newspapers and the farm bureau news of various counties.

Vegetable Gardening

During the past year, specialists in the Department of Vegetable Gardening made a larger number of personal contacts and did more effective extension teaching than in any previous year. Growers have shown more interest in extension work than ever before. As in previous years, the extension work has been conducted along three distinct lines — commercial gardening, home gardening, and junior project work and school gardening.

Due to the general economic condition existing in the State, a large part of the extension activities have been directed along the line of more economical production and better grading and handling methods. Such work has been done in counties where commercial vegetable production is new, as well as in the older producing regions. It develops that many dairy and grain farmers are looking for vegetable crops to round out their farming practices. There is danger of over-production of special crops when general farmers go into production of them, and the department has lost no opportunity to call attention to this danger.

The demand for service along the line of grading and standardization of vegetable crops continues. The summer season of 1923 was rather disastrous to many growers of head lettuce in New York. Such keen competition has developed in the growing of this crop, particularly in the Rocky Mountain district of the West, that the New York producers are being forced to improve their marketing practices. In cooperation with a representative of the United States Bureau of Agricultural Economics, field meetings were held in practically all the lettuce sections, where the advantages of the federal grades were explained. A similar series of meetings was held during the winter, reaching many new growers. Definite requests have been made by growers for instruction in grading and in shipping-point inspection of lettuce.

The better-seed campaign was continued. The use of seed of known origin has been urged. Strain and variety tests show that some strains are

superior in yield and other desirable qualities. The growers have been urged to purchase seed of certain crops a year in advance, in order to test part of it before the general planting. This practice is now rather extensively practiced by celery and cabbage growers, and has resulted in better crops and greater profit. The widespread use of certified potato seed at the present time can be attributed to such field demonstrations. Similar work with field beans is being undertaken this year.

The department has cooperated with county agents and growers in conducting field demonstrations along the lines of better seed, fertilizer, grading, and the use of green-manure crops. The crops included in these demonstrations are beans, cabbage, cauliflower, lettuce, celery, potatoes, sweet corn, and tomatoes.

At the request of a large group of muck-land farmers, this department, assisted by the New York Department of Farms and Markets and the United States Department of Agriculture, conducted a muck-land survey in many of the counties during the past year. The county agent and his committees obtained the actual records, which were summarized and returned to the growers. Due to the scattered areas of muck in State, little effort has been made heretofore to compile accurate records of the acreage of the various vegetables being grown. The completion of this survey has been requested.

Exhibits showing the teaching, extension, and research activities of the department were set up at the Rochester Exposition, at the State Fair at Syracuse, and at the annual meeting of the Vegetable Growers' Association of America at Buffalo. Members of the staff also assisted many county fairs by supplying judges of vegetables.

At the request of the Association of the New York State Cannerymen, a three-days school for cannerymen's field men was held at the College during the week of March 18. This was the first school of the kind ever held in the State, and it was voted a success by the 46 men in attendance. In fact, the members voted unanimously to request the College to make the school an annual affair, and suggested that the owners and managers of the factories be invited. The lectures and discussions covered information on cultural practices, fertilizers, varieties, improvement by breeding and selection, and control of disease and insect pests of fruits and vegetables grown for canning. Instruction was given by nine departments of the College and three departments of the experiment station at Geneva.

On June 1, 1924, 36 students were enrolled in the Farm Study Courses in vegetable gardening and vegetable forcing. Of these, 29 are taking the work in commercial vegetable gardening and 7 that in vegetable forcing. The textbook used in this course was changed during the year and the outlines were revised to bring them up to date. The number of active students has not been large, but the interest has been exceptionally good, as is evidenced by the total of 280 completed lessons received and graded during the year. Three certificates have been awarded for completion of the courses, and several additional persons have nearly completed the work.

Effective extension work in home gardening is conditioned upon a gradually increasing realization among the people of the value of vegetables in the diet and the need of a regular, continuous, and abundant

supply of them. Several agencies are distributing this kind of information. With one of them, the School of Home Economics at the College, the department is closely cooperating. Every home-garden lecture delivered during the year has been in part devoted to a discussion of the selection and culture of those garden crops that are most valuable in the diet. Home-garden lectures in cooperation with the home bureaus and with the college nutrition specialists have been given in fifteen counties. Approximately 2190 people were addressed at these meetings, most of them adults. Many other adults were present at meetings primarily intended for girls and boys, and heard similar material given in a different form. One home-garden lecture was given by radio from the broadcasting station at Schenectady.

The Home Study Course in home gardening enrolled during the year 212 persons, who sent in 386 completed instruction papers. Thirty-nine press articles were prepared. The series sent to weekly papers, bearing the title *Hoe Handle Homilies*, gives general suggestions for soil preparation, fertilizing, and cultivation, together with more special advice on the growing of each of the more important garden crops.

The extension work with boys and girls deals with the junior corn, bean, potato, and garden projects. The bean and corn projects have relatively few enrollments. The garden project seems to be increasing in popularity. Garden work with boys and girls, like home-garden extension work with adults, stresses the vegetables most valuable in the diet, especially tomatoes, leaf crops, and string beans. The State Fair premium list for children's garden exhibits, and several of the county fair junior lists, have been revised at the suggestion of this department, so that higher prizes are offered for these more important crops. Visits have been made to seventeen counties in the interest of junior crop and garden projects. There have been given 22 demonstrations and 219 lectures, with an attendance of 803 and 15,218, respectively. The large attendance at lectures is due to the fact that these are often given at schools, sometimes to rather large groups. One high-school audience at Hempstead, Long Island, numbered 1100.

Specialists in the department spent 315 days in the field; held 76 demonstrations with a total attendance of 2335, 138 conferences with an attendance of 849, and 303 farm visits and inspections; and gave 318 lectures attended by 20,801 persons. The total number of personal contacts in the field was 24,359. There were 69 extension articles written, totaling 191 pages. Data available for the months of March, April, and May show a circulation of these articles of more than three million, and the total circulation for the year was at least double that number. There were 41 circular letters written, with a total circulation of 1195, and 2538 personal letters. Six mimeograph bulletins with a total of about 24 pages, and manuscripts for extension bulletins of approximately 160 typewritten pages, were prepared.

FINANCIAL SUMMARY

A complete financial statement of all funds from all sources used by the State College of Agriculture appears in the annual report of the Comptroller of Cornell University, printed separately. Copies may be had on application to the Comptroller. A summary of receipts and expenditures is here appended.

REPORT OF THE DEAN

FINANCIAL STATEMENT, 1923-24

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1923	Receipts (college and Smith-Hughes) 1923-24	Expenditures 1923-24	Balance	
						Lapsed	Unexpended June 30, 1924
State							
1922-23 Maintenance.....	\$1,222,675.00	\$1,158,660.25	\$ 64,014.75	.....	\$ 38,764.03	\$ 25,250.73	.....
1922 Equipment of new dairy industry building.....	183,000.00	40,992.76	142,007.24	.....	142,007.24	.....	.....
1922 Remuneration of milk streamers building, 1923	15,000.00	12,494.42	2,505.58	.....	2,505.58	.....	.....
1923	11,800.00	9,273.50	2,526.50	.....	1,153.59	1,372.91	.....
1923 Deficiency (for fuel, light, power, and water).....	27,000.00	19,997.08	7,002.92	.....	2,533.91	4,469.01	.....
1923-24 Maintenance.....	1,377,105.00	.....	1,377,105.00	.....	1,250,785.07	.....	\$126,319.93
1924 Deficiency (for fuel, light, power, and water).....	26,500.00	.....	26,500.00	.....	.....	.....	26,500.00
1924 Deficiency (for repairs, etc.).....	5,400.00	.....	5,400.00	.....	5,399.04	0.96	.....
1924 Deficiency (for repairs, etc.).....	2,000.00	.....	2,000.00	.....	1,269.84	.....	730.16
Total.....	\$2,870,450.00	\$1,241,418.01	\$1,629,061.99	.....	\$1,444,418.30	\$31,093.60	\$153,550.09
Federal							
Morrill and Nelson.....	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch and Adams.....	27,000.00	.....	27,000.00	.....	27,000.00	.....	.....
Smith-Lever.....	198,634.11	.....	198,634.11	.....	196,121.64	\$2,512.47	.....
Smith-Hughes.....	.....	.....	*(4,796.00)	\$23,708.52	21,859.04	.....	*(2,946.61)
Total.....	\$245,634.11	.....	\$240,838.02	\$23,708.52	\$264,980.68	\$2,512.47	*(2,946.61)
College							
Tuition and fees } Sales and services }	.....	.....	\$91,701.69	{ \$ 71,464.05 271,823.86	\$385,556.03	.....	\$49,433.57
Total.....	\$91,701.69	\$143,287.91		\$385,556.03	.....	$49,433.57
Grand total.....	.....	.....	\$1,961,601.70	\$366,996.43	\$2,094,955.01	\$33,606.07	\$200,037.05

* Overdrafts on Smith-Hughes Fund covered by subsequent remittances from the State Department of Education.

CONCLUSION

I desire to record my appreciation of the deep interest shown and the active support of the work of the State College of Agriculture given by the President and Trustees of the University, and by the Chief Executive of the State, members of the Legislature, and the state fiscal officers. The College is also under constant obligation to the farm folk of the State for aid and encouragement in many phases of the work.

In the preparation of this report, I desire to acknowledge the helpful assistance rendered by Professor D. J. Crosby, acting for the Director of Extension, Dr. R. W. Thatcher, Director of Experiment Stations, and Dr. Cornelius Betten, Director of Resident Instruction.

Respectfully submitted,

A. R. MANN,
*Dean of the New York State College of
Agriculture and of the Agricultural
Experiment Stations.*

INDEX

A	PAGE
Absences, unexcused, faculty action on.....	14
Agricultural Economics and Farm Management, extension work.....	58
Agricultural Economics and Farm Management, research.....	25
Agronomy experimental fields, outlying	22
Agronomy, extension work	60
Agronomy, research	26
Anderson, E. J., appointment.....	12
Animal Husbandry, extension work.....	62
Animal Husbandry, research	29
Appropriations of Legislature for 1924-25.....	7
B	
Bookkeeping, extension work in.....	66
Botany, departmental notes	18
Botany, extension work	65
Botany, research	29
Boutelle, G. A., resignation.....	11
Building acquisitions	11
Building program	10
Burritt, M. C., resignation as director of extension.....	12
C	
Class absences	14
Class grades	14
College farms, size and character of.....	16
Collingwood, G. H., resignation.....	11
Conventions held at College.....	14
County and town fairs.....	44
D	
Dairy industries, dedication of new building.....	11
Dean's report	7
Departmental notes	18
Directory of former students.....	15
E	
Emerson, R. A., scientific expedition to South America.....	20
Enrollment of students	13
Entomology, extension work	65
Entomology, research	30
Experiment station work	21
Extension, directorship of	12
Extension schools	44
Extension Service	40
F	
Faculty. See Staff.	
Fair exhibits	43, 44
Farm bureaus	47
Farmers' Week	41
Farms, college, size and character of.....	16
Farrand, Livingston, letter of transmittal.....	5
Fellowships	9
Felton, R. A., appointment.....	12

	PAGE
Field Days, Junior	4
Financial summary	5
Floriculture and Ornamental Horticulture, departmental notes.....	6
Floriculture and Ornamental Horticulture, extension work.....	6
Forestry, departmental notes	7
Forestry, extension work	7
Forestry, research	7

G

Geneva, agricultural experiment station at.....	21
Gibson, A. W.	5
Gifts	13
Grades, class, change in system.....	14
Greenhouses, plans for new range.....	14

H

Hall, I. C., appointment.....	15
Heuser, G. F.....	15
Home bureaus	21
Home Economics, departmental notes.....	22
Home Economics, extension work.....	22
Home Economics, School of, bill to designate as College.....	22
Horticultural investigations, Hudson River Valley.....	22

I

Indian extension work	23
Ithaca station, research activities at.....	23

J

Junior extension	24
Junior extension, new law.....	24
Junior Field Days	24

L

Ladd, C. E., appointment as director of extension.....	25
Legislative enactments	27
Library building, new, plans for.....	28
Long Island vegetable research farm.....	28

M

Mann, A. R., report.....	29
Marketing and agricultural business administration, provision for instruction in.....	29
Melvin, B. L., appointment.....	31
Meteorology, extension work	31

N

News service	33
New York Agricultural Experiment Station at Geneva.....	33
New York State Bankers' Association scholarships.....	38
New York State Grange scholarships.....	38
Norton, L. J., resignation.....	41

P

Pack, Charles Lathrop, prizes donated by.....	40
Phillips, E. F., appointment.....	42
Plant Breeding, departmental notes.....	43
Plant Breeding, extension work.....	43
Plant Breeding, research	43

	PAGE
Plant industry building, new, plans for.....	10
Plant Pathology, extension work.....	74
Plant Pathology, research	34
Pomology, departmental notes	20
Pomology, extension work	76
Pomology, research	36
Poultry Husbandry, departmental notes.....	20
Poultry Husbandry, extension work.....	77
Pratt, George D., gift from.....	10
President's letter of transmittal.....	5
Prizes	10
Publication, Office of	52
Publications, distribution of	53
Publications, list of	55
Publications, summary of	57

R

Research activities of College.....	21
Reynolds, Ellen A., resignation.....	11
Richey, F. D.	20
Roberts, Charles H.	10
Roberts scholarships, increase of amount.....	10
Ross, H. A., appointment.....	12
Rowlee, W. W., obituary notice.....	13
Rural Education, departmental notes.....	21
Rural Education, extension work.....	78
Rural Education, research	37
Rural Engineering, departmental notes.....	21
Rural Engineering, extension work.....	78
Rural Social Organization, departmental notes.....	21
Rural Social Organization, extension work.....	79
Rural Social Organization, research.....	37
Russell, H. E.	11

S

Scholarships	10
Sherman, J. M., appointment.....	12
Spray-information service	80
Staff, changes in	11
State Fair exhibits	43
Stocking, W. A.	12, 18
Student enrollment	13
Study courses	53

T

Town and county fairs.....	44
----------------------------	----

V

Vegetable Gardening, extension work.....	81
Vegetable Gardening, research	38
Vegetable research farm, Long Island.....	22
Vineyards, experimental, outlying	22

W

Wallace, Robert	11
-----------------------	----

State of New York

New York State College of Agriculture
at Cornell University

Cornell University Agricultural Experiment Station
New York State Agricultural Experiment Station

Thirty-Eighth Annual Report

1925

LIVINGSTON FARRAND, President of the University

A. R. MANN,
Dean

CORNELIUS BETTEN,

Director of Resident Instruction and Acting Dean

R. W. THATCHER,
Director of Experiment Stations

C. E. LADD,
Director of Extension

Transmitted to the Legislature January 15, 1926

Cornell Univ.
Agri. Experiment Sta.
3-8-1926

THIRTY-EIGHTH ANNUAL REPORT

of the

New York State College of Agriculture at Cornell
University, and of the Cornell University
Agricultural Experiment Station

STATE OF NEW YORK

DEPARTMENT OF FARMS AND MARKETS

Albany, January 15, 1926.

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Thirty-eighth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Farms and Markets.

BERNE A. PYRKE,

Commissioner of Farms and Markets.

PRESIDENT'S LETTER OF TRANSMITTAL

July 28, 1925.

The Governor of the State of New York,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Commissioner of Farms and Markets,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

The Act of the Legislature of the State of New York, approved April 12, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said university shall expend such moneys and use such property of the state in administering said college of agriculture as above provided, and shall report to the commissioner of agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said college of agriculture for the year ending the thirtieth day of September then next preceding."

The Act of the Legislature of the State of New York, approved February 24, 1925, designating the New York State College of Home Economics at Cornell University and providing for its administration, stipulates that an annual report of the expenditures and operation shall be made to the Commissioner of Education. Inasmuch as the College of Home Economics was established less than half a year prior to June 30, and was during that period administered on funds allocated to it from those appropriated to the College of Agriculture, it seems best to postpone the first separate report of the College of Home Economics until after a full year of separate operation shall have elapsed.

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the year 1924-25 of the New York State College of Agriculture and the Agricultural Experiment Stations.

On behalf of the University I make acknowledgment of the generous support given by the Legislature of the State to the work of the institutions, which is reviewed in this report. While the requests made for an improved salary scale were not fully met, the budget items of personal service were materially increased and a considerable measure of relief is afforded where it was most needed. It is a pleasure also to acknowledge the intelligent and sympathetic consideration that has been given to the varied needs of the College and the experiment stations on the part of the official representatives of the State.

Pending the decision of the people upon the proposed bond issue to provide for the construction and repair of state buildings, no appropriations for construction at the College of Agriculture were made in 1925, and the distressing housing conditions, now of many years standing, remain unrelieved. There has been no question as to the urgency of this situation, and it is confidently hoped that if the bond issue is acted upon favorably by the people of the State the program may be rapidly carried forward. Under existing circumstances some phases of the work, both in home economics and in agriculture, are distinctly curtailed and otherwise rendered ineffective.

The most significant event of the year is the erection by legislative act of a State College of Home Economics. This involved but little administrative change, since the work in home economics had long ago reached a stage of development so that a college existed in all but the name. A formal division of administration seemed necessary, both because the subjects of instruction in agriculture and in home economics are so diverse as to demand the attention of separate faculties, and also because the constituencies of the two units in resident students and in the homes of the State are naturally distinct. It is highly important that the women of the State shall have an institution peculiarly their own, responsive to their needs. At the same time the two colleges have much in common in their services to the rural people of New York, and every effort will be made to conserve the advantages that have become apparent in the close association of previous years.

The following pages give evidence that the varied activities of the College of Agriculture are being carried on with unabated vigor, and it is particularly gratifying to find that in spite of the acute and prolonged depression in agriculture the direct support of the cooperative work carried on in the counties of the State has been not only maintained, but actually increased.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1924-25

June 30, 1925

To the President of the University:

SIR: We have the honor to submit a report of the New York State College of Agriculture, the New York State College of Home Economics, and the Agricultural Experiment Stations under the administration of Cornell University, for the fiscal year 1924-25. Inasmuch as the State College of Home Economics was designated by the State Legislature and separately organized in the middle of the second term of the year, we at this time offer a report common to the two college units as heretofore, postponing the beginning of a series of separate reports for the College of Home Economics until after a full year of separate operation.

Temporary adjustments in administration

At its meeting in June, 1924, the University Board of Trustees granted Dean A. R. Mann leave of absence in order that he might be free to render an important service in the great work now being carried on by the International Education Board. That board undertakes to aid education on an international scale by pooling in some measure the educational resources of the various countries, by aiding persons or agencies whose exceptional contributions to education have been made ineffective by the war, and by supporting through initial stages enterprises that have promise both of worth and of future growth from their native support. An important phase will be the giving of opportunity for persons occupying strategic educational positions in one country to strengthen their work by study in another country. In carrying forward this program, particular attention is given to the fields of agriculture, forestry, veterinary medicine, and home economics, and Dean Mann was selected by the International Education Board to lay the groundwork of this part of the international service. Recognizing both the distinguished honor thus accorded to Dean Mann, and his eminent qualifications for the task, the University has cooperated by releasing the Dean on August 1, 1924, with the expectation that his leave in Europe will continue through two years. The experience gained by Dean Mann in this large and significant undertaking will not fail to find application later to the work of the College and to the agriculture of the State.

During Dean Mann's absence the immediate administration of the College is entrusted to a committee composed of the directors of research, extension, and resident instruction.

The State appropriations

The total of the appropriations made to the College by the Legislature of New York in 1925, including deficiency items, is \$1,625,230, a net increase of \$95,670 over the total of last year. A part of the increase (\$37,500) results from the action of the Legislature of 1924 in raising the State's annual contribution to the county home bureaus to \$600 and

in placing the county junior extension work on a similar supporting basis. While this was determined by the Legislature of 1924, no appropriations were actually made at the time, and the Legislature of 1925 therefore voted the appropriation of not only \$20,400 for 1925-26 but also \$17,100 for the deficiency of 1924-25. The item of fuel, light, power, and water was increased over that of last year by \$26,000, the figures for both years including deficiencies. Of the total increase, about \$52,000 is applicable to the salaries of the staff of instruction, research, and extension in agriculture and in home economics. While providing but half of what were judged to be imperatively needed salary advances, this gives very substantial and greatly appreciated relief to a considerable number of members of the staff. The appropriation shows a decrease of \$15,000 in accessory instruction in Cornell University, and of \$10,400 in repairs. Lesser deviations from last year's schedule in other items bring the total net increase to \$95,670.

The Purnell Act

The Purnell Act providing increased support for the experiment stations, after having been under consideration for some years, was enacted into law by the national Congress and becomes effective on July 1, 1925. The State Legislature has assigned to Cornell University the funds thus appropriated, for use in the experiment stations under its administration. Under the terms of the law each of the States receives an allotment of \$20,000 the first year, with annual increments of \$10,000 until 1929-30, when the total received that year and thereafter will be \$60,000. The funds are applicable to research in any of the lines of work ordinarily falling within the scope of colleges of agriculture and of home economics, but the law makes special reference to "such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life"—newer phases not clearly contemplated under the earlier acts in support of research.

For the purpose of considering procedure under the Purnell Act with a view to unifying the programs carried forward and to providing a measure of cooperation, a meeting of experiment-station directors was held at St. Louis on April 20 and 21, 1925. This conference recommended the following problems of national scope:

In the field of agricultural economics:

Distribution and marketing of farm products.

The problem of surpluses of farm products.

In the field of home economics:

Vitamin content of food in relation to human nutrition.

Rural home-management studies.

In the field of rural sociology:

Rural social organization and agencies essential to a permanent and effective agriculture.

In the field of production:

Factors influencing the production and quality of meats.

The conference also suggested problems for cooperative attack in regions designated as North Atlantic States, South Atlantic and Cotton States.

Corn Belt States, and Intermountain and Pacific States. For the North Atlantic States the cooperative program already adopted by these States was approved.

Special grants

The General Education Board has made a grant to the University of \$10,000 a year for five years, for increasing the facilities for graduate study in the Department of Rural Education. The main purpose of the gift is to make possible the expansion of the work of the department in training persons for supervisory positions in the field of elementary education. Provision is made also for inaugurating graduate study in the methods of extension teaching. In connection with these developments Dr. Clyde B. Moore, previously of the University of Pittsburgh, has been appointed Professor of Rural Education, and Professor T. H. Eaton is to be in charge of the other new phase in the work of this department.

The pronounced shift of emphasis in agriculture from the problems of production to those of distribution, and the increasing interest in rural social conditions which has been evident for some years, are reflected in the effort of the College to make a corresponding expansion of program in these newer fields. This grant from the General Education Board is a welcome aid in this direction.

The Laura Spelman Rockefeller Memorial has made to the University a grant of \$13,000 annually for four years, to be used in initiating work in child care and training in the College of Home Economics. This has been supplemented for 1925-26 by grants of \$3000 for providing quarters and equipment, and \$7000 for carrying on extension work in child care and training in selected counties in the State. There can be no doubt of the great need or of the eagerness of the demand on the part of the homes of the State. It represents a large undertaking for the College of Home Economics, and provision will need to be made, not only for continuing the enterprise after the expiration of the special grant under which it is begun, but also for strengthening the work in psychology, sociology, and other contributing fields. The College of Home Economics is fortunate in having this project begun under Dr. Nellie L. Perkins, who has for some time been lecturer in social psychiatry at the University of Michigan and director of the Wayne County psychopathic clinic connected with the juvenile court at Detroit, Michigan.

The New York State Bankers' Association has again given specific evidence of deep interest in the boys' and girls' clubs throughout the State. For 1925-26 the association is providing eight scholarships of \$250 each for those making the best showing in junior project work during the preceding year in specified areas of the State. The scholarships are assigned by the college authorities and are applicable to the expense of attendance at the winter courses of the College or at the courses of the six state secondary schools of agriculture.

A grant of \$750 was received from the *American Agriculturist*, establishing a temporary fellowship for the study of the marketing of farm products, the holder to be under the direction of the staff of the Department of Agricultural Economics and Farm Management of the College.

The Williamson Cooperative Vegetable Growers' Association fellowship for the investigation and demonstration of the control of diseases and pests of muck crops, after having been in operation for seven years, has been renewed for two years from April 1, 1925.

The New York State Grange has withdrawn the twelve scholarships which for many years have been open on competitive examination to those intending to enroll in the winter courses. Instead of offering these scholarships, the Grange will now make loans to the students of the winter courses.

Acknowledgment should be made of the cooperation of the beekeepers of this and other States in an effort to develop at the College a strong library of beekeeping. Already donations from seventy-eight persons have added 1400 volumes in this field. Several lots of books have been received from the families of early leaders in American beekeeping, those of Moses Quinby, Julius Hoffman, and P. H. Elwood of New York, Dr. C. C. Miller of Illinois, A. I. Root of Ohio, D. W. Livingston of Georgia, and J. B. Mason of Maine, being the most noteworthy. The library has acquired by purchase several complete sets of the leading foreign bee journals, and has completed sets of four American journals by donation. The A. I. Root Company, of Medina, Ohio, has arranged to obtain every possible foreign bee journal by exchange for *Gleanings in Bee Culture*, and will place the exchanges in this library as a memorial to Mr. A. I. Root, the founder of the company. Donations in cash amounting to more than \$200 for an endowment fund for the maintenance of this library have been made, and already about fifty beekeepers have expressed their desire to cooperate in the establishment of such an endowment fund by setting aside colonies of bees, the proceeds from which are to be placed with the University for this fund. Several organizations of beekeepers in this and other States also have undertaken to contribute to this endowment fund. The Ohio Beekeepers' Association has arranged to endow a memorial to the Reverend L. L. Langstroth, the inventor of the beehive now in common use, and officers of other organizations have agreed to urge similar action on their members in the near future. Altogether these generous donations will develop a unique library of beekeeping and a noteworthy addition to an already strong library of entomology.

The New York State College of Home Economics

The bill designating the School of Home Economics as the New York State College of Home Economics, whose passage was presaged by the legislative action of last year, was passed by the Legislature of 1925 and became law by signature of the Governor on February 24, 1925. This is in recognition of the fact that the services rendered by the two divisions — agriculture and home economics — are so distinct as to require separate organization of the faculties and of some other agencies of administration. It will be of very great advantage, particularly to the homemakers of the State, to have a separate college responsive to their needs in the fields now recognized as within the scope of home economics. It is at the same time apparent that a degree of uniformity of procedure in the two colleges is essential, particularly in the administration of

state and federal funds and in the organization of many of the college activities. To conserve the advantages of unified action the two Colleges have been placed under the administration of the same Dean, and the services of other agencies, such as the library, the business office, the publication office, and the secretary's office, will be used in common.

While for many years the lines of work in home economics have been fairly well differentiated, the Board of Trustees of Cornell University has this year approved the organization of the following departments: Foods and Nutrition, Textiles and Clothing, Household Art, Household Management, Institution Management, and Family Life.

The college building program

While the executive and legislative authorities of the State have expressed their approval of rapidly furthering the college building program to which the State is expressly committed, no further appropriations for this purpose were made in 1925, the view being advanced that this program should be a part of the larger state building program for which a state bond issue is proposed. The College must therefore resign itself to still another year of the really embarrassing space conditions that have hampered the work for many years. Of the appropriations made in 1923 there remains available a sufficient amount to provide for certain operations necessary in preparation for the erection of the plant industry and library buildings, but not enough to make in addition more than a small beginning on the construction of these buildings. Chief among the preparatory operations is the construction of a new greenhouse range for the Department of Floriculture and Ornamental Horticulture and the Department of Vegetable Gardening, and this work was begun in May. During the summer the rural engineering laboratories will be removed to a site to the south of the animal husbandry group, the offices of the departmental staff having already been shifted to the new dairy building. The old college heating plant will be remodeled into a garage to house the college automobiles and trucks which now have inadequate parking area in the rear of East Roberts Hall. These various operations do not in themselves increase the working space of the departments, but they serve to clear the site for the new buildings. The plans for these buildings are complete, and therefore it should be possible to enter upon construction promptly when the funds are made available.

Cooperation with the International Education Board

Aside from the release of Dean Mann from his regular duties for two years, already mentioned, there have been other cooperative efforts on the part of the College and the International Education Board during the year. It has been a pleasure to welcome to the College a number of men of recognized position in educational work in Europe, sent by the Board, who have spent a number of weeks here in studying the organization of agricultural education in the United States and in getting into intimate touch with the work of some of the departments of the College. It is a pleasure also to acknowledge the generosity of the Board in providing the services of Professor O. H. Larsen, of Copenhagen, for a period of

six months. Professor Larsen was appointed as Professor in the Department of Agricultural Economics and Farm Management, and he has brought a distinct contribution because of his knowledge and experience in the field of cooperative marketing, so well developed in his home country.

The International Education Board has also joined with the College in a project which is being carried on with the University of Nanking in China. The plan contemplates a thoroughgoing study of plant improvement in China upon the basis of modern methods of hybridization and selection. The College will release, for a part of each year and through a series of years, some of its experts in plant breeding, and their support will be furnished by the International Education Board and the University of Nanking, the latter institution providing also the land and facilities for the work to be done. The plans definitely include the training of native Chinese to carry forward plant-improvement work permanently, and it is hoped that several centers for such work may be developed in China. The beginning of this project is undertaken by Dr. H. H. Love, who is in China for the season of 1925.

Changes in the college staff

The staff has lost by resignation, during the year, the following members: M. V. Atwood, Professor in Extension Service and Assistant Chief of Publications, August 9, 1924; Winifred Moses, Assistant Professor of Home Economics, June 30, 1924; and E. F. Guba, Extension Assistant Professor of Plant Pathology, May 30, 1925. With the end of the academic year will terminate also the service of Dr. J. R. Schramm as Professor of Botany. After eleven years of noteworthy service Dr. Schramm is undertaking, at the request of the Union of Biological Societies and of the National Research Council, the very important task of instituting and editing an abstracting journal including the whole range of the biological sciences and covering the biological literature of the world.

Professor Wilford Murry Wilson retired from active service as Professor of Meteorology on June 30, 1925, having on January 24 reached the age of sixty-five years. Dr. Wilson attended Allegheny College, and later received the degree of M. D. from the Memphis Hospital Medical College. He entered the service of the Government in 1885 as an observer in the Signal Corps, which later became the United States Weather Bureau. In this service he has continued for forty years at many posts and in charge successively of the Weather Bureau stations at Memphis, Milwaukee, and Ithaca. Dr. Wilson came to Cornell University in 1906, began his lectures in meteorology soon thereafter, and in 1910 was appointed Professor of Meteorology. He was the first man to receive appointment as Professor of Meteorology, and the first to organize a Department of Meteorology. For eighteen years Dr. Wilson has conducted undergraduate courses, during seven years he has directed the work of graduate students, and during the past five years he has taken an active part in the agricultural extension program. His contribution in the last-named field involved the formulation at the College of highly specialized fruit-spray forecasts and harvest forecasts, and the cooperation of many persons at the College and in the counties in broadcasting these

forecasts. In 1924 the fruit-spray forecasts were used in twenty-eight counties, and the harvest forecasts in thirty-five counties. This service has been so conspicuously successful that Congress has now made an appropriation for its development on a wider scale. Dr. Wilson is to retain his position as Meteorologist and Section Director of the Weather Bureau with headquarters at Ithaca. The College congratulates Dr. Wilson upon his fine career, and wishes for him many happy years among his long-established associations.

During the year, twelve members of the professorial staff have been on sabbatic leave of absence during one or both terms. In addition, Professor P. W. Claassen was released for the year in order that he might accept the invitation of Hsing Hua College, in China, to spend a period there in teaching and in reorganizing the college courses in biology. Director Thatcher was in Washington for several weeks as a member of the President's Agricultural Commission.

The following appointments became effective during the year: J. Nelson Spaeth, Research Assistant Professor of Forestry; Joshua Allen Cope, Extension Assistant Professor of Forestry; Dr. Paul F. Sharp, Professor of Dairy Chemistry; Dr. Faith M. Williams, Assistant Professor of Home Economics. Dr. M. D. Leonard was given temporary reappointment as Assistant Professor of Entomology, in order to complete for publication the state list of insects, and, as already noted, Professor O. H. Larsen, of Copenhagen, was added to the staff of Agricultural Economics and Farm Management for a period of six months.

Appointments effective on July 1, 1925, have been approved by the Board of Trustees as follows: Dr. Loren C. Petry, Professor of Botany; Dr. Clyde B. Moore, Professor of Rural Education; in the College of Home Economics, Dr. Nellie L. Perkins, Professor of Home Economics, and Dr. Edith H. Nason, Assistant Professor of Home Economics. Dr. L. L. Bernard has been appointed Acting Professor of Rural Social Organization for the first term of 1925-26, to take the work of Professor Dwight Sanderson, who will be on sabbatic leave.

The student enrollment

The enrollment of students in agriculture since 1924 has followed a closely similar course in all of the older and larger colleges. Taking the ten largest colleges of agriculture together, the highest enrollment was reached in 1915-16. The war brought a sharp decline to about half the pre-war figures. The two years following the close of the war saw a sudden return to nearly the highest previous figures, due in part to the return of students whose course had been interrupted by war service. Since then there has been a steady decline, bringing these colleges again to about half the pre-war enrollments. This College followed the same general trend, but the loss during the war was greater than the average and the recovery of numbers immediately after the war was far less marked than in many of the other colleges. In this College the decrease in undergraduates in agriculture has been in part counterbalanced by increases in home economics and in graduate students, so that the total enrollment is now less than twenty-five per cent below that of 1915-16.

The enrollment of 1924-25 is given below in comparison with that of the preceding year. Of the 1239 regular and special students, 483 may be regarded as automatically transferred from the College of Agriculture by the organization of the State College of Home Economics:

	1923-24	1924-25
Freshmen	421	397
Sophomores	300	313
Juniors	233	279
Seniors	220	215
	<hr/>	<hr/>
Special students	1,174	1,204
	36	35
Winter-course students:		
Agriculture (general)	101	67
Dairy Industry	48	43
Poultry Husbandry	52	50
Fruit Growing	18	10
Flower Growing	19	8
Vegetable Gardening	2	2
	<hr/>	<hr/>
Graduate students	240	180
Summer-school students	202	231
	584	621
	<hr/>	<hr/>
	2,236	2,271
Less number counted twice.....	100	104
	<hr/>	<hr/>
	2,136	2,167
	<hr/>	<hr/>

Special conventions

The College welcomes during the course of a year a considerable number of gatherings of short duration, for which the facilities and the staff of the College are gladly made available. The following events were held during 1924-25:

	Attendance
Summer conference of town and county pastors, July 7-19.....	35
1924 poultry-judging school, July 7-12.....	106
Tompkins County picnic, July 30.....	300
New York State Seed Improvement Association, August 1.....	125
Cortland County picnic, August 11.....	450
Farmer-banker meeting, August 25-26.....	60
Annual conference of extension workers, October 27 to November 1..	243
Clothing training-school, October 21 to November 11.....	33
1924 poultry-production exhibition, December 2-4 (695 exhibitors, 1027 birds)	500
Canning-crops conference, January 6-9.....	60
Beekeepers school, January 26-31.....	92
1925 Farmers' Week, February 9-14.....	3,620
Northeastern Section, American Society of Agricultural Engineers, April 10-11	45
Junior field days, June 24-26.....	1,450
New England farm bureau agents, June 25.....	20
Indian field days, June 26.....	62
Chemung County Farm Bureau picnic.....	325

RESEARCH AND EXPERIMENT STATION ACTIVITIES

Some progress was made during the year toward the development of a unified program of research for the several agricultural research agencies which are now under the administration of Cornell University. The absence of the Dean of the College of Agriculture, in Europe, and of the Director of Experiment Stations, on service with the President's Agricultural Conference in Washington at intervals during the year, prevented as rapid development of plans in this direction as had been hoped. Also, a permanent program of this kind depends in part upon the development of research laboratory facilities in the new buildings which it was hoped would be available both at Geneva and at Ithaca by this time. The veto by the Governor of the appropriation made by the Legislatures of 1924 and 1925 for the new horticultural research laboratory building at Geneva, and the postponement, at the Governor's request, of the appropriation for the plant industry building at Ithaca, has delayed the provision of these indispensable facilities for the adequate development of our research program. But the general spirit of cooperation among the research workers at the several branches of the institution, which was noted last year, has continued undiminished, and it is believed that real progress toward a united attack upon the unsolved problems of agricultural science and practice is being made.

WORK AT OUTLYING STATIONS

• Experimental work on local agricultural and horticultural problems is conducted at the two experimental fields in agronomy at Alfred and Churchville, under the supervision of the Department of Agronomy at the Cornell station; at the Long Island vegetable research farm at Riverhead, under the supervision of the Department of Vegetable Gardening at the Cornell station and of the Divisions of Botany and Entomology at the Geneva station; at the experimental vineyards at Urbana and Fredonia, under the supervision of the Division of Horticulture at the Geneva station; and in the Hudson River Valley horticultural investigation in Columbia, Dutchess, and Ulster Counties, under the supervision of the Divisions of Horticulture, Entomology, and Botany of the Geneva station.

Agronomy experimental fields. The experiments in progress at Alfred and at Churchville include: (1) a test of the quantities of acid phosphate fertilizer that should be used on the two soil types represented on the fields; (2) a test to determine whether the phosphate should be supplemented by a nitrogenous fertilizer and also by a potash carrier; (3) trials of various crops, particularly forage crops, not commonly used in this region; (4) tests of substitutes for the oat crop in the hope of finding a better-yielding and more profitable crop than oats, these tests including mixtures of barley and oats and mixtures of these grains with Canada peas; (5) mixtures of corn and soybeans for silage.

Long Island vegetable research farm. At the close of the second season of operation of the vegetable research farm at Riverhead, the research and experimental work is well organized and is making satisfactory progress. The general character of the work, and the area of land devoted to each project, may be briefly summarized as follows:

Soil-management studies (six acres): This block of land is being studied to determine any natural soil differences prior to beginning the long-time soil-management studies. One crop is grown over the entire area each year, and records of yields are kept by rows and by plats. These records will show both the variability of the soil, and the number of replications and size of plats which it will be necessary to use in order to obtain reliable data from different kinds of crops and treatments which are to be used in later studies.

Cover-crop and green-manuring experiments (three acres): The object of these experiments is to determine what are the best crops to be grown to furnish humus to the soil under the various cropping systems in use on Long Island. The results are recorded in terms of quantity of material yielded, and effects on succeeding crops of vegetables.

Soil-reaction studies (one and one-half acres): This is an experiment to determine the effects of varying degrees of alkalinity and acidity of the soil upon the growth of cauliflower, potatoes, and some other crops, when these crops are grown either continuously or in rotation.

Tomato-nutrition experiment (three acres): Various combinations of fertilizers and manures are applied to this land, and the responses of the tomato plants are measured by yield records and by chemical analyses of plants and fruit.

Asparagus culture (one and one-half acres): This is a variety and cultural experiment.

Sweet-corn suckering experiment (one acre): This experiment is for the purpose of determining the effects of removal of suckers on yield, size of ears, earliness, and other factors.

Cultivation of vegetable crops (one acre): Six vegetable crops are given varying cultivation treatments, to check the results obtained from the same treatments under different soil and climatic conditions at Ithaca.

Variety and strain tests of vegetables (two acres): Miscellaneous tests of important varieties and strains of vegetables.

Experiments in the control of plant diseases and insect pests (two acres): These consist of field tests to supplement greenhouse and laboratory investigations of the life history and the methods of control of the pests that affect vegetable crops on Long Island. At present these investigations deal with black rot and whiptail disease of cauliflower, and carrot blight, and with the control of aphids on cabbage and cauliflower and of several insects on potatoes. A successful method of seed treatment for the cauliflower rot has already been worked out and is being given extensive demonstration this year.

Experimental vineyards and Hudson River Valley horticultural investigations

Satisfactory progress has been made in the general program of horticultural investigations which is under way at these outlying stations. Brief summaries of progress in each of the individual projects there are included in the annual report of the Geneva station.

THE STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA

As in former years, a detailed report of the activities of the New York Agricultural Experiment Station for the year ending June 30, 1925, will be published separately as the Forty-fourth Annual Report of that station. It shows a healthy and vigorous development of research spirit and work, and many definite contributions to knowledge of agricultural science and practice during the year.

The Legislature of 1925 again made an appropriation for the erection of a horticultural research laboratory building at the Geneva station. This was again vetoed by the Governor, on the ground that "This is a permanent state building and should be provided for from the bond issue now ending." At the same time, the Legislature made provision for considerably increasing the staff of research workers at the station to take care of urgently needed new lines of research work, especially in connection with the production of fruit and vegetable canning crops. As a result, the station laboratories, which were already overcrowded, are entirely inadequate for the staff, many of whom are now compelled to work in attic or basement rooms which are wholly unfitted for research of the quality for which the station is noted. It is sincerely to be hoped that the necessary funds for the erection of this vitally essential addition to the station's building equipment will be provided by the next Legislature and will then meet with the Governor's approval.

RESEARCH ACTIVITIES AT ITHACA

As was pointed out in last year's report, and for the reasons there given, it is not possible to give at any one time a complete picture of the research activities of the staff of the State College of Agriculture at that time. A review of the list of bulletins and papers emanating from the several departments, as presented below, shows that such significant progress was made in many different lines of investigation as made it possible to publish definite conclusions which add very materially to the knowledge of agricultural science and practice.

In addition to these statements concerning published results of research studies, certain general comments concerning their facilities or plans for research, which have been made by the several heads of departments, may be briefly summarized in order to give a more complete review of research progress during the year.

One set of lysimeter studies of soil was brought to a conclusion at the end of fifteen years of observation, during which the amount of rainfall received by the soil in each of the lysimeters for the entire period was recorded, the drainage waters were collected and analyzed, and the crops grown each year were likewise analyzed for their content of elements derived from the soil. The composition of the soil at the beginning of the experiment was determined, and the eight tanks are now being emptied and the soil again analyzed. When these data are compiled and studied, a complete picture of the plant-nutrient relationships of soil, crop, and drainage losses will be available.

The marketing investigations which were made possible by the special appropriation for instruction and research in this field granted by the

Legislature of 1924, were promptly inaugurated and vigorously prosecuted throughout the year, with the result that several important contributions in the form of bulletins and special reports of these studies either were issued or are in process of publication at the close of the year. Reference to these is made elsewhere in this report.

In the Department of Rural Engineering, studies of several problems in barn ventilation were advanced very materially by the devising of new instruments, or by new adaptations of others, for measuring temperature and humidity and for studying the rate and direction of air currents in barns having different ventilation systems.

In forestry, definite progress can be reported in the study of the methods of handling and the rates of growth of second-growth hardwood trees as a farm crop.

The investigations in methods of propagation of mayfly larvae for use as food for young game birds, and of certain aquatic insects as food for edible fish, brought excellent results and are now ready for commercial demonstration. Experiments in fish culture showed some remarkable variations in rapidity of growth of fish from the same lot of eggs, under identical environmental conditions, with several species of trout, and indicate the possibility of developing rapid-growing strains of these valuable game and food fishes. More adequate facilities for carrying on these investigations than are now available are urgently needed.

The construction during the coming summer of the new range of floral greenhouses will provide proper physical plant facilities for some much-needed investigations in propagation and in the development of new varieties of ornamental flowers and shrubs of commercial importance, if proper research personnel can be provided for this work.

In the field of rural social organization, very interesting data have been accumulated dealing with the relations of village and rural populations to the standards and habits of rural living conditions, and with the causes of shifting populations in rural communities. It is hoped and expected that the analyses of these data will throw much light upon the problems of rural social life and its ultimate improvement.

Bulletins and papers published during the year

The following is a brief review of the published results of the research activities of the several departments which have appeared in print during the year, together with certain notes concerning material which is now ready for publication. It presents a general view of the results of the year's research work, in so far as it has come to the point of preparation for publication.

Agricultural Economics and Farm Management

In the Department of Agricultural Economics and Farm Management, the following is a list of titles of papers that have been published. Inasmuch as most of these are in regular publications of the New York State College of Agriculture and are thus available to readers of this report, no attempt is here made to give abstracts of these papers:

- William Allen—Effect of changing lumber prices on cuttings in farm woodlots. Farm econ., no. 25:286. 1925.
- W. Bartlett—The organization and development of cooperative fire insurance companies in New York. Cornell Univ. Agr. Exp. Sta. Bul. 435. 1924.
- W. Bartlett—Cooperative fire insurance in New York. Farm econ., no. 21:236-237. 1925.
- W. Bartlett—Prices of evaporated and condensed milk. Farm econ., no. 25:301-303. 1925.
- L. Buck—Prices of farm products in a famine-stricken area. Amer. Statis. Assoc. Journ. 20, no. 150. 1925.
- S. Gabriel—Freight rates on milk. Farm econ., no. 25:304-305. 1925.
- S. Gabriel—Prices and freight rates for farm products. Farm econ., no. 22:256. 1925.
- S. Gabriel—Freight rates on milk. Farm econ., no. 25:304-305. 1925.
- B. Corbett—Costs of packing apples. Farm econ., no. 25:306-308. 1925.
- B. Genung—What 100 years have done to farm taxes. Farm econ., no. 25:285-286. 1925.
- G. Misner—An economic study of dairying on 163 farms in Herkimer County, New York. Cornell Univ. Agr. Exp. Sta. Bul. 432. 1924.
- G. Misner—Economic studies of dairy farming in New York. II. Grade A milk with and without cash crops. Cornell Univ. Agr. Exp. Sta. Bul. 433. 1924.
- G. Misner—Economic studies of dairy farming in New York. III. Grade B milk with alfalfa roughage. Cornell Univ. Agr. Exp. Sta. Bul. 438. 1925.
- G. Misner—Farm management problems in the northeastern dairy belt. Journ. farm econ. 7:251-273. 1925.
- G. Misner—The cost of producing milk and some factors influencing the cost. World's Dairy Congress. Proc. 2:1097-1111. 1924.
- G. Misner—Prices of Long Island potatoes. Farm econ., no. 17:159-164. 1924.
- G. Misner—Prices of state potatoes. Farm econ., no. 18:175-180. 1924.
- G. Misner—Rainfall and alternate bearing habits as factors affecting the production and price of apples. Farm econ., no. 24:270-272. 1925.
- N. I. Myers and L. Spencer—How farmers are financing their farm operations. Farm econ., no. 11:102-103. 1924.
- V. Noble—New York State farm cost accounting results. Farm econ., no. 20:208-215. 1924.
- V. Noble—The cost of living in a small factory town. Cornell Univ. Agr. Exp. Sta. Bul. 431. 1924.
- A. Pearson—Prices of farm products. Farm econ., no. 17:154-156. 1924.
- M. P. Rasmussen—Costs of marketing potatoes. Farm econ., no. 19:191-196. 1924.
- M. P. Rasmussen—An economic study of the marketing of New York potatoes. Cornell Univ. Agr. Exp. Sta. Bul. 440. 1925.
- M. P. Rasmussen—Distribution of up-state New York potatoes. Farm econ., no. 21:231-233. 1925.
- M. P. Rasmussen—An economic study of the marketing of New York State potatoes. Potato news bul. 2:93-103. 1925.
- H. A. Ross—Consumption of milk in Chicago as affected by price. Farm econ., no. 20:205-207. 1924.
- G. P. Scoville—Incomes on fruit farms in western New York for the past eleven years. Farm econ., no. 18:171-173. 1924.
- G. P. Scoville—Potato production and prices. Farm econ., no. 19:188. 1924.
- G. P. Scoville—Returns from tomatoes and canning factory peas. Farm econ., no. 22:252-253. 1925.
- Leland Spencer—Some facts about the New York milk market. Farm econ., no. 21:234-235. 1925.
- Leland Spencer—An economic study of rural store credit in New York. Cornell Univ. Agr. Exp. Sta. Bul. 430. 1924.
- Leland Spencer—Variations in deliveries of milk at country plants. Farm econ., no. 22:254-255. 1925.
- Leland Spencer—Relation of temperature to receipts of milk and cream at the New York market. Farm econ., no. 25:298-300. 1925.
- G. F. Warren—Adjusting farming to the probable price level. Farm econ., no. 11:92-101. 1924.
- G. F. Warren—Farm population in New York State. Farm econ., no. 12:112, 1924, and no. 23:262, 1925.

- G. F. Warren — European conditions affecting agriculture. *Farm econ.*, no. 19:186-187. 1924.
- G. F. Warren — Danish and American dairying. *Farm econ.*, no. 25:292. 1925.
- G. F. Warren — Milk production per cow in New York. *Farm econ.*, no. 25:293. 1925.
- G. F. Warren — Die Landwirtschaft der Vereinigten Staaten. (Translated by M. Sering.) *Reichsmin. für Ernährung und Landw. Ber. über Landw.*, N. F. 11:651-704. 1925.
- G. F. Warren and F. A. Pearson — Farm, wholesale, and retail prices of nine products. *Farm econ.*, no. 14:126-132. 1924.
- G. F. Warren and F. A. Pearson — Prices of beef cattle. *Farm econ.*, no. 19:190, and no. 20:207. 1924.
- G. F. Warren and F. A. Pearson — Retail prices of milk in New York city and prices paid to farmers for milk. *Farm econ.*, no. 20:202-204. 1924.
- G. F. Warren and F. A. Pearson — Chickens. *Farm econ.*, no. 22:247-248. 1925.
- G. F. Warren and F. A. Pearson — Periods of over- and under-production of sheep. *Farm econ.*, no. 22:249-250. 1925.
- G. F. Warren and F. A. Pearson — Comparison of cycles of over- and under-production. *Farm econ.*, no. 23:263. 1925.
- G. F. Warren and F. A. Pearson — Milk prices and prices of industrial stocks. *Farm econ.*, no. 23:264. 1925.
- G. F. Warren and F. A. Pearson — Farm wages. *Farm econ.*, no. 25:277-278. 1925.
- G. F. Warren and F. A. Pearson — Wages of different classes of workers. *Farm econ.*, no. 25:279. 1925.
- G. F. Warren and F. A. Pearson — Purchasing power of city wages. *Farm econ.*, no. 25:280-282. 1925.
- G. F. Warren and F. A. Pearson — Prices of purebred dairy cattle. *Farm econ.*, no. 25:291. 1925.
- G. F. Warren and F. A. Pearson — Adjustment of milk production to prices. *Farm econ.*, no. 25:294. 1925.
- G. F. Warren and F. A. Pearson — Effect of the price of beef on the milk production per cow. *Farm econ.*, no. 25:295. 1925.
- G. F. Warren and F. A. Pearson — The agricultural situation. Economic effects of fluctuating prices. (Book, published by John Wiley and Sons.) 1924.

The following manuscripts have been accepted for publication as bulletins of the Experiment Station:

- H. S. Gabriel — Index numbers of freight rates and their relation to agricultural prices and production.
- E. G. Misner — The marketing of cabbage.
- E. G. Misner — Economic studies of dairy farming in New York. IV. Grade B milk with cash crops and mixed hay roughage, crop year 1921.
- E. G. Misner — Economic studies of dairy farming in New York. V. Cheese-factory milk.
- L. J. Norton and L. Spencer — A preliminary study of milk marketing in New York.
- M. P. Rasmussen — An economic study of the marketing of New York potatoes.

The following paper is ready for publication:

- J. L. Buck — Social and economic factors in China.

Agronomy

In the Department of Agronomy the following papers have been published:

- A. F. Gustafson — The use of standard soils with the potassium thiocyanate test for estimating lime-requirement of soils. *Amer. Soc. Agron. Journ.* 16:772-776. 1924.

This paper presents the author's views based on his observations and experiences with the potassium thiocyanate, or Comber, test for determining the lime requirement of clover and alfalfa on various so-called sour soils. When an alcoholic solution of potassium thiocyanate is shaken with a soil deficient in bases, a reddish color develops, the degree of redness depending on the deficiency of bases; that is, the more deficient or the more sour the soil, the deeper is

the resulting red color. Color charts have been used for estimating the lime requirement of soils for different crops. The author proposes the use of "standard" soils instead of color charts. The lime requirement of these "standard" soils has been determined by several laboratory methods, and the response of clover and alfalfa to liming them is known from field observations. Direct comparison of the color developing in the "unknown" samples with that of the "standard" soils is suggested for obtaining reliable lime-requirement estimates. For this purpose, soils must be air-dry. It is urged that special care be exercised to keep all conditions uniform throughout the test.

F. Gustafson — Fallen trees a cause of hummock formation. Amer. Soc. Agron. Journ. 16:782-787. 1924.

This brief paper presents an outline of the published theories of the formation of hummocks in peat, muck, or other naturally undrained areas. The body of the paper presents the author's observations supported by illustrations from a peat bog in southern Michigan. From these it appears that the trunks of trees which have fallen on the muck land have become covered by swamp vegetation, have decayed, and finally have become a part of the muck itself. The trampling of livestock appears to have cut the "log-hummocks" into smaller ones. These emanate from a stump and lie in a line, showing their probable origin to have been a fallen tree.

E. Hance — Inhibition of bumping in the determination of nitrogen in soil. Amer. Soc. Agron. Journ. 16:790-791. 1924.

This paper discusses a departure from the usual Kjeldahl procedure, in which greater accuracy is obtained in shorter time and using a much smaller sample. As usual, 2.8 grams of the powdered soil is digested. Instead of extracting the product with successive portions of water for the alkaline distillation, the contents are diluted, are made alkaline, and are distilled directly by placing the flasks on asbestos collars which are supported on wire gauze above Bunsen flames. The flasks are heated by the upward passage of hot gases through the intervening asbestos collars. This prevents local superheating at any point in the container, and consequently boiling takes place evenly and quietly. The method was employed successfully in the analysis of several hundred samples of soil.

L. Lyon, A. J. Heinicke, and B. D. Wilson — The relation of soil moisture and nitrates to the effects of sod on plum and cherry trees. Cornell Univ. Agr. Exp. Sta. Memoir 91. 1925.

Plum trees and cherry trees were grown on field plats continuously in sod, and on plats on which rye was used as an annual cover crop. All plats were fertilized with acid phosphate and muriate of potash. Nitrate of soda was applied to certain of the sod and of the cover-crop plats, and was withheld entirely from others. Moisture and nitrates in the soil were determined from time to time. Measurements were made of the tree growth each season, and the weights of the trees were ascertained at the end of the experiment. Nitrate nitrogen was always low under sod, except when large quantities of nitrate of soda had been applied recently. During the dry year of 1921 the soil moisture was lower under sod than under cultivated plats, but there was no difference in this respect during 1922. Tree growth was greatest on the sod plats that received the greatest quantity of nitrate of soda, indicating a deficiency of available nitrogen under the unfertilized sod. The low moisture content in 1921 was evidently not a limiting factor in growth, since the trees on many sod plats showed a greater increase in circumference in 1921 than in 1922, a year of abundant rainfall. That the removal of moisture from the soil by the grass was not an important factor in inhibiting tree growth was further indicated by the fact that the growth of the trees was greatest on those sod plats in which the moisture was least, owing to a greater growth of grass resulting from the large applications of nitrate of soda. Apparently the maintenance of an adequate supply of nitrate nitrogen in the soil used in this experiment was the determining factor in tree growth, and soil moisture was very much less important. The average growth of plum trees in sod which received 900 pounds or more of sodium nitrate, was about twice as great as that of trees in sod which received no nitrate fertilizer. Plum trees on the cultivated plats showed no response to applications of sodium nitrate. The trees on the heavily nitrated sod plats, however, averaged only about two-thirds as large as those on the

cultivated plats. The average growth of cherry trees in sod which received 900 pounds or more of sodium nitrate, was more than twice as great as that of trees in sod which received no nitrate fertilizer. Cherry trees on the cultivated plats which received no sodium nitrate were about two-thirds as large as those receiving the heaviest application of nitrate of soda. The cherry trees on the heavily nitrated sod plats averaged nearly as large as those on the cultivated plats without added nitrogen.

- E. H. Panganiban — Temperature as a factor in nitrogen changes in the soil. *Amer. Soc. Agron. Journ.* 17:1-31. 1925.

The purpose of this investigation was to study the effect of constant as well as alternating temperatures on the nitrogen changes in the soil. In this connection ammonification, nitrification, denitrification, and nitrogen fixation were studied. The optimum temperature for ammonification was not ascertained. The process gradually increased up to 60° C., which was the highest temperature studied. Apparently thermophilic organisms are found in all soils. The optimum temperature for nitrification in soil is about 35° C. or slightly higher. Denitrification was greatest near from 25° to 30° C. Optimum nitrogen fixation, under both anaerobic and aerobic conditions, was found to be somewhere between 25° and 30° C., or approximately normal field temperature. The results indicate a higher nitrogen fixation under anaerobic than under aerobic conditions.

- J. A. Pepin — The rôle of calcium in Dunkirk and Volusia soils. *Sci. Agr. [Canada]* 5:16. 1925.

In this paper an attempt is made to determine the reasons for the beneficial effects of calcium carbonate on Dunkirk clay loam and Volusia silt loam. The application of calcium carbonate, in quantities approximating the lime requirement as determined by the Veitch method, caused an increase in the yield of alfalfa grown in the greenhouse. In similarly treated uncropped pots, it was found that calcium carbonate caused an increase in the nitrate content and in the water-soluble potassium and calcium. Calcium carbonate applied to Volusia silt loam caused an increase in the yields of red clover and barley, and in the content of nitrates and water-soluble calcium. Volusia silt loam was shown also to be deficient in available phosphorus. In this connection it was found that the rate of increase in yield decreased with increasing amounts of soluble phosphorus on the unlimed pots, while this rate increased on the limed pots, indicating the desirability of applying both calcium carbonate and phosphorus to this soil.

- N. E. Winters — Soil conditions which promote nitrogen fixation. *Amer. Soc. Agron. Journ.* 16:701-716. 1924.

A study was made of the part which bacterial activities may play in keeping up soil productivity. This was done by using soils that are of considerable importance in the southern part of New York State. To these soils various materials were added, and the amount of nitrogen accumulated was determined by standard methods and compared with that of the same soil untreated. The addition of basic materials usually increased the amount of nitrogen in the soil, dolomitic limestone being better than pure calcium limestone. Nitrogenous materials such as sodium nitrate, when applied in quantities such as are used in fertilizers, usually stimulate nitrogen fixation; this fixation, however, was usually accompanied by a decrease in nitrates, probably due to the assimilation of them by soil organisms. When conditions were made favorable for nitrogen fixation, inoculation of the soil with nitrogen-fixing bacteria was unnecessary.

- E. L. Worthen — A common error in interpreting financial returns from fertilizer experiments. *Amer. Soc. Agron. Journ.* 16:776-781. 1924.

The relative financial returns from different fertilizer treatments cannot be ascertained when the costs of the treatments are different. Two methods have been employed in making corrections for differences in cost of treatment. When based on percentage returns on the investment, the less expensive of the two treatments is favored; while the net return obtained by deducting the cost of treatment from the value of the crop increase, generally favors the more expensive treatment.

- E. L. Worthen — The economic interpretation of the results of fertility experiments. *Amer. Soc. Agron. Journ.* 17:233-244. 1925.

There are six factors frequently entering into the interpretation of financial returns from plat experiments, which tend to increase unduly the net returns

from the treatment. They are: (1) high crop values; (2) low cost for treatment; (3) depleted check plats; (4) more intensive production; (5) inadequate supplementary treatment; (6) inadequate correction for difference in cost. The error entering into the calculations of financial returns from fertilizer experiments is deserving of greater consideration than it has received in the past. Conclusions should be in full agreement with the returns which would result from the use of fertilizer in actual farm practice.

The following papers are ready for publication:

- L. S. Boyer — The effect of phosphorus deficiency on the growth of wheat.
- G. J. Callister — The study of the soil nitrogen of a peach orchard.
- M. H. Cubbon — A study of calcium sulfate and biological reactions in soil.
- Shukri Hussein — A comparative study of the total quantities of nutrients in arid and humid soils.
- R. W. Johnson — Effect of soluble organic matter of straw on nitrification in soil.
- D. F. Kinsman — A study of muck soil.
- W. M. Phipps — The nature of the organic matter of calcareous and noncalcareous soils.
- S. Waterman — The carbon-nitrogen ratio in high- and low-calcium soils.

Animal Husbandry

In the Department of Animal Husbandry the following papers have been published:

- M. W. Harper — Feeding work horses. Cornell Univ. Agr. Exp. Sta. Bul. 437. 1925.

This bulletin gives the results of a study contrasting the relative usefulness of oats and of corn as grain for the work horse. A series of tests were conducted, in which the two grains were fed in various combinations and occasionally supplemented with other concentrates including hominy, wheat feed, wheat bran, and linseed-oil meal. The bulletin contains results of a study regarding the amount of hay that may be fed with safety and without hindering the horse's efficiency; a study concerning the relative efficiency of chaffed hay and of long hay; and a study comparing alfalfa hay and timothy hay as a forage for the work horse. In measuring the usefulness of these rations a number of factors were considered, such as the weight, the health, the appetite, and the spirit of the horse, together with the relative economies of the rations.

- L. A. Maynard, S. A. Goldberg, and R. C. Miller — A study of the dietary relationships and the pathology of "stiffness" in swine. Cornell Univ. Agr. Exp. Sta. Memoir 86. 1925.

The results of experiments continuing for three years, reported in this paper, show a relationship between the diet and the pathological condition designated as "stiffness" in swine. When young growing pigs were fed indoors on various rations which were low in calcium and consisted largely of cereals and cereal by-products, stiffness was induced. The principal and constant lesions were found in the femurs, and indicated a condition of imperfect calcification. Prevention or cure of the trouble was obtained by the separate addition of cod-liver oil, fish meal, or a mixture of equal parts of ground limestone and bone meal, to the basal ration. Thus the trouble was attributed to a lack of supply of minerals in the ration or to a deficiency of the factor affecting their assimilation. Chemical analyses checked the pathological findings, and these showed a low phosphorus and calcium content of the femurs of affected animals.

- L. A. Maynard, L. C. Norris, and W. E. Krauss — Rearing calves by the use of calf-meal gruel. Cornell Univ. Agr. Exp. Sta. Bul. 439. 1925.

As a result of experiments covering a period of three years and involving twenty-three heifer calves, most of which were Holsteins, a calf-meal gruel was formulated which gave better results than have been reported for any other method designed to reduce the amount of milk required for rearing calves. Gain in height and weight, and the general physical condition of the calves, were used as the measures of the success of the method. Figures for feed consumption and costs are included in the bulletin. The final decision as to the value and practicability of the method is left to the farmer.

- L. C. Norris — The production of volatile fatty acids in the intestinal tract of calves fed whole milk or cereal gruel. Cornell Univ. Agr. Exp. Sta. Memoir 90. 1925.

The effect of diet upon the production of volatile fatty acids and of alcohols in the feces of growing calves is reported in this paper. It was found that calves which received a cereal-gruel diet excreted daily a much larger quantity of acid and alcohol than did those which received a whole-milk diet. The author believes that this difference in the quantity of acid and alcohol excreted indicates that young calves do not have the power to completely digest large amounts of carbohydrates. Therefore the partially digested food residues are acted upon by bacteria, resulting in the production of acids and alcohols. Acetic and propionic acids were the only ones discovered in the feces of the calves. These acids were present in an approximate 1:1 ratio. Ethyl alcohol also was found in large quantities, but propyl occurred in only two cases and then in very small amounts. The presence of esters was not revealed by this study.

The following paper has been accepted for publication and is in press:

- L. A. Maynard, S. A. Goldberg, and R. C. Miller — The influence of sunlight on mineral nutrition of swine.

The following papers are ready for publication:

- L. A. Maynard, S. A. Goldberg, and R. C. Miller — Further studies on the influence of sunlight on bone development in swine.
R. C. Miller — The calcium and phosphorus balance of dairy cows.

Botany

In the Department of Botany the following papers have been published:

- O. F. Curtis — Studies on the tissues concerned in the transfer of solutes in plants. The effect on the upward transfer of solutes of cutting the xylem as compared with that of cutting the phloem. Ann. bot. 39:573-585. 1925.

Though many types of ringing experiments previously reported have uniformly shown that ringing has interfered with the upward transfer of solutes, it had not been definitely shown that this hindrance may not have been due to plugging or other alteration of the xylem resulting from the ringing. Evidence is discussed which indicates that plugging could have been but partial, at most, and that partial plugging could not fully account for the hindrance in solute movement. Experiments in which the effect on solute transfer of cutting the xylem is compared with that of cutting the phloem, are described. These experiments supplied data showing that when the shoots were attached to the parent plant by the xylem only, they failed to grow, evidently because some material necessary for growth could not move through the xylem; while shoots connected by a strip of phloem made a growth nearly as good as did the stems with both xylem and phloem, indicating that the phloem could carry these materials. Determinations showed that the water content of the ringed shoots exceeded that of the checks and that of the shoots with the xylem cut, indicating that the failure to grow was not due to lack of water. Sugar determinations showed, in one series, that the ringed shoots had an excessively low sugar content as compared with the checks and the stems with the xylem cut, indicating that the growth had been limited by lack of sugar; while in another series, the ringed shoots, though they had less total sugar, had on the percentage basis a sugar content considerably in excess of that in the shoots receiving the other treatments, indicating that some other factor was limiting in this series. It seems that both the upward and the downward movement of inorganic and organic materials occur chiefly through the phloem tissue of the bark, not through the xylem or the wood as has been commonly thought; and it is suggested that this movement is hastened by streaming movements within the living cells.

- Evelyn I. Fernald — The inhibition of bud-development as correlated with the osmotic concentration of sap. Amer. journ. bot. 12:287-305. 1925.

The purpose of the investigation here reported was to determine whether the dominance of the terminal buds of shoots over the lateral buds is in any way related to the relative osmotic concentrations of these tissues. Most of the studies were made with potato tubers and sprouts, and with stems of *Philadelphus*, *Ligustrum*, and *Bryophyllum*. The data obtained indicate that there is a close correlation between dominance and the high osmotic concentration of the terminal part of a stem, which accounts for the ability of this part to compete successfully for water with other tissues which have lower concentrations. In those plants that did not show marked terminal dominance there was but little difference in osmotic concentration between the different tissues. Cessation of terminal-shoot growth seemed to be correlated with a condition in which the osmotic concentration of the leaves exceeded that of the growing tip.

Adelle L. Grant — A monograph of the genus *Mimulus*. Missouri Bot. Garden. Ann. 11:99-388. 1924.

This is a discussion of the taxonomy and the geographical distribution of *Mimulus*, a genus belonging to the family Scrophulariaceae. In all, 114 species are recognized, these occurring in North America, South America, Asia, Africa, and Australia. The center of distribution seems to be in California, where 74 species are found, 51 of which have not been collected outside of that State. The members of the genus are divided into two subgenera, and these into ten sections. Nineteen species and nine varieties are described for the first time.

2. F. Hopkins — Relation of low temperatures to respiration and carbohydrate changes in potato tubers. Bot. gaz. 78:311-325. 1924.

In determining the respiration of potatoes at low temperatures, there was found to be a marked acceleration in the rate at 0° C. (32° F.), such that for a considerable period the intensity was greater than at 4.5° C. (40° F.). This stimulation passed through a maximum and then decreased, but at the end of the experiment it was still greater than at 4.5° C. (40° F.). The curve of respiration for temperatures from -0.83° C. (30.5° F.) to 11.5° C. (52.7° F.) was determined. A minimum point in this curve was found to be at about 3° C. (37.4° F.), and, as the temperature decreased, respiration increased at 0° C. (32° F.) and then again declined. The carbohydrate changes were studied at various temperatures, and it was found that at 0° C. (32° F.) sugar accumulation is slow at first, then increases rapidly, and finally decreases. At 4.5° C. (40° F.) the sugar content is nearly constant; at 1.17° C. (34° F.) it increases fairly rapidly from the start; while at -0.83° C. (30.5° F.) there is gradual increase in total sugars but a decrease in reducing sugar. In agreement with results reported in the literature, it is found that sugar accumulated in potatoes at 0° C. (32° F.) began to disappear rapidly when they were stored at 4.5° C. (40° F.). It is suggested that the acceleration of respiration at 0° C. (32° F.) is dependent on the changing concentration of sugar, and that up to a certain concentration sugar increases respiration, and beyond that inhibits it.

J. E. Knott — Effect of soaking seed of some vegetables before sowing. Amer. Soc. Agron. Journ. 17:49-54. 1925.

The soaking of seed before planting has been claimed by various authors to have exerted on the young seedling a stimulating effect that was evident throughout its life. The data presented in this paper show that soaking the seed of beet, cabbage, and tomato for twenty-four hours in shallow distilled water produced no difference in growth or yield if the time of planting was so adjusted that the seedlings from the soaked and the dry seed appeared above the ground at the same time. The initial start of the soaked seed at a time when the plant is at its greatest efficiency is suggested as the cause of the apparent gain shown in previous work. The soaking affected the length of the germination period differently with the various crops used.

J. E. Knott — Effect of cold temperature on growth of vegetables. Amer. Soc. Agron. Journ. 17:54-57. 1925.

Production of seedstalks in the first season by biennials has been believed to be due to the exposure of seed to very low temperatures after early planting in the field. Cabbage and beets failed to produce seedstalks in the first year when germinated at 10° C. and 5° C., respectively, or when exposed to a temperature of 0° C. for half the germination period. This suggests that the critical period when such plants can be shifted from vegetative to reproductive

growth is sometime during the young seedling stage. The change is probably associated with prolonged cool periods rather than with sharp drops, in view of the fact that the cooler the average temperature is in the spring up to about June 1, the more will cabbage, beet, celery, and other biennials go to seed in their first summer.

- L. W. Sharp — The factorial interpretation of sex-determination. *La cellule* 35:193-235. 1925.

This is a review of certain cytological and other data bearing on the problem of the determination of sex, particularly in plants, together with a discussion of sex and its inheritance in terms of genetic and environmental factors.

- F. B. Wann — Some of the factors involved in the sexual reproduction of *Marchantia polymorpha* L. *Journ. Amer. bot.* 12:307-318. 1925.

Marchantia polymorpha gametophytes respond to the photoperiod in a manner similar to that characterizing "long-day" plants among the flowering plants. When subjected to artificially lengthened days in the winter, mature antheridiophores are produced in from three to four weeks, mature archegoniophores in from six to eight weeks, and mature sporophytes in from ten to twelve weeks. It is thus possible to bring plants into proper condition for class study at any desired time by controlling the photoperiod. A relatively high humidity tends to hasten the sexual response, while a relatively low humidity tends to retard or may inhibit the production of sexual branches, especially archegoniophores. A relatively low nitrogen to high carbohydrate ratio in the culture medium may result in the formation of sexual branches. No attempt was made in these experiments to control the temperature.

- C. L. Wilson — Medullary bundle in relation to primary vascular system in *Chenopodiaceae* and *Amaranthaceae*. *Bot. gaz.* 78:175-199. 1924.

An anatomical study of the primary vascular system in the pigweed and amaranth families demonstrates the probable origin and method of evolutionary modification of the medullary bundles found in these families. These bundles are cauline and leaf-trace bundles which have secondarily acquired a position in the pith. At first the bundles were deflected from their course merely in the nodal region because of the complex nodal structure; ultimately the proportion of the course lying within the pith became very great, and finally, in some species, the bundles have come to lie wholly within the pith.

The following manuscripts have been accepted for publication:

- A. J. Eames and L. H. MacDaniels — An introduction to plant anatomy. (Book to be published by McGraw-Hill Book Co.)
 Julia M. Haber — The anatomy of the flower of *Euphorbia*.
 K. M. Wiegand — *Oxalis corniculata* and its relation in North America.
 K. M. Wiegand and A. J. Eames — The flora of the Cayuga Lake Basin, New York.

The following papers are ready for publication:

- D. G. Haylett — Some effects of humidity on the respiration of plant tissue.
 E. F. Hopkins — Variation in sugar content in potato tubers caused by wounding and its possible relation to respiration.
 J. E. Knott — Physiological study of flower-stalk production in spinach.
 J. E. Knott — Studies of the catalase reaction.
 F. B. Wann — The effect of the H-ion concentration on the growth of *Lemna minor*.
 F. B. Wann and E. F. Hopkins — The relation of the H-ion concentration to the growth of *Chlorella* sp. and to the availability of iron.

Dairy Industry

In the Department of Dairy Industry the following papers have been published:

- J. D. Black (Univ. Minnesota) and E. S. Guthrie — Economic aspects of creamery organization. *Univ. Minnesota Agr. Exp. Sta. Technical bul.* 26. 1924.
 This is an exhaustive economic study of the organization, business methods and efficiency of one hundred and two Minnesota creameries.

- B. Ellenberger (Univ. Vermont) and E. S. Guthrie — The trier compared with the wedge method of sampling tub butter. Journ. dairy sci. 8:80-88. 1925.

A critical study of two methods in use for the sampling of tub butter is reported in this paper. The wedge method appears to give the more accurate results.

- C. Hall and K. Matsumura — Recovery of *Bacillus tertius* from stools of infants. Journ. infect. diseases 35:502-504. 1924.

Bacillus tertius is evidently an early and frequent invader of the intestinal tract of infants both well and unwell. It occurs also in the feces of older children and of adults, and in the feces of sheep. There is no evidence of pathologic significance. Being an active lactose fermenter, it has the same significance in the bowel that *B. coli* and *B. welchii* have. It is a facultatively, not, as hitherto supposed, an obligately, anaerobic microorganism.

- C. Hall and C. Westbay — Bacterial factors in pyorrhea alveolaris. II. Further studies on reaction changes in saliva due to microorganisms and their possible relation to the formation of dental calculus. Dental cosmos 67:115-124. 1925.

A study of reaction changes during incubation of forty samples of saliva taken from prisoners at San Quentin Prison, California, and from others with a wide variety of dental conditions, showed that all the samples became alkaline (terminal value pH 8.4-8.6) in a few days, in open or loosely stoppered containers, except in the presence of fermentable carbohydrates, when they became acid with a terminal value of pH 4.6. Close stoppering prevents the alkaline change, evidently through the buffering action of CO₂, but does not affect the production of acid in the presence of carbohydrates. The observations have a bearing upon the theory of the formation of dental calculus at the gingival margin rather than in the pyorrhetic pocket.

- A. Ruehe — Effect of the process of manufacture on the germ content of bulk condensed milk. Cornell Univ. Agr. Exp. Sta. Memoir 76. 1924.

It was found in these experiments that more than ninety-nine per cent of the bacteria contained in the raw material are destroyed in the process of manufacturing bulk condensed milk.

- M. Sherman and H. R. Curran — The germicidal action of milk. Soc. Exp. Biol. Med. Proc. 22:15-17. 1924.

By the employment of new methods, it is shown that fresh milk has a very slight but definite retarding effect on the growth of bacteria.

- C. Troy — A comparison of the methylene blue reductase test and the direct microscopic count in grading milk at milk plants. Journ. dairy sci. 8:282-285. 1925.

A study was made of the methylene blue reductase test in comparison with the direct microscopic count method for the grading of milk under commercial conditions. The two methods were found to check very well.

The following papers have been accepted for publication:

- W. Bell — The effect of heat on the solubility of the calcium and phosphorus compounds in milk.

- C. Hall — Bacterial factors in pyorrhea alveolaris. III. The isolation of *B. tetani*, *B. welchii*, and other sporulating anaerobes from human saliva.

- C. Hall — Selective localization of *Corynebacterium pseudotuberculosis* (diphtheroid bacillus of Preisz and Nocard) in experimentally infected guinea pigs.

- C. Hall and B. Howitt — Bacterial factors in pyorrhea alveolaris. IV. *Micrococcus gazogenes*, a minute gram negative non-sporulating anaerobe prevalent in human saliva.

The following papers are ready for publication:

- Knaysi — Increasing the yield of cheese by the addition of calcium chloride to milk.

- V. V. Price — The manufacture of Cheddar cheese from pasteurized milk.

- M. Sherman — The production of catalase by an anaerobic organism.

- M. Sherman and C. K. Tucker — The value of vacuum packing for cottage and cream cheese.

Entomology

In the Department of Entomology the following papers have been published:

- J. C. Bradley — Insect life. A manual for the use of boy scouts in fulfillment of the requirements for the insect life merit badge, and for others interested in insects. (Book, published by Boy Scouts of America.) 1925.

The contents of this book may be briefly outlined as follows: requirements for the merit badge in insect life; thirty-seven kinds of insects — where and how they live; keeping social insects under observation; making a collection of insects; rearing an insect; about entomology as a profession, and entomologists. sketch of the life of John Henry Comstock, by Professor S. H. Gage; bibliography; common kinds of insects, of which any scout can find and name fifty; a list of the orders and families of insects found in the United States, with a key to the pronunciation of their names.

- J. L. Buys — The Cicadellidae of the vicinity of Ithaca, New York, with special reference to the structure of the gonapophyses. Cornell Univ. Agr. Exp. Sta. Memoir 80. 1924.

This systematic study of the leaf-hopper fauna in the southern Cayuga Lake Basin was undertaken primarily to discover additional structural characters for a better interpretation of species of this economically important group of insects. Numerous species, distributed among thirty-two genera, are described, and keys to the one hundred and sixty-three species thus far recorded from New York State are included.

- S. C. Bishop and C. R. Crosby — A fossil species of Caddo (Opiliones) from the Baltic amber, and its living relatives. New York State Mus. Bul. 253:83-84. 1924.

This paper presents a comparison of the two living species of Caddo from New York with the fossil from the Tertiary Baltic amber. The type specimen of the fossil is redescribed and figured.

- C. R. Crosby — A note on two genera of spiders, Mysmena and Microdiploca. Canad. ent. 57:50. 1925.

- C. R. Crosby and S. C. Bishop — Two new spiders from the Blue Ridge Mountains of North Carolina (Araneina). Ent. news 36:142-146. 1925.

A new species of Leptoneta is described in this paper. The genus is well represented in Europe, but this is the first record in the United States outside of California. In this paper is also described the smallest known tarantula, less than 3 millimeters in length.

- C. R. Crosby and S. C. Bishop — Studies in New York spiders. Genera: Ceratinella and Ceraticelus. New York State Mus. Bul. 264:5-71. 1925.

This paper reports the first part of a study of the Erigonae begun in 1904. The drawings were in large measure paid for by the Heckscher Research Foundation of Cornell University. The purpose of this study is to find, if possible, generic characters in the male palpi. The work cannot be completed until all the genera are thoroughly studied; only the first two are treated in this paper.

- C. R. Crosby and S. C. Bishop — Notes on the Opiliones of the southeastern United States with descriptions of new species. Elisha Mitchell Sci. Soc. Jour. 40:8-26. 1924.

These notes deal with Opiliones collected in the southeast since 1912. Nine new species are described and revised keys are given.

- S. W. Frost — A study of the leaf-mining Diptera of North America. Cornell Univ. Agr. Exp. Sta. Memoir 78. 1924.

In this paper the characteristic leaf mines of the two-winged flies are described and keys for their recognition, keys to the larvae, and keys to imagines, are given. Descriptions of a number of species are included, and also a list of the leaf-mining Diptera of the world, with their host plants. The bulletin contains not only a large amount of new work, but also a comprehensive review of the work of other authors in this field.

- G. W. Herrick — Notes on some little known thrips (Thysanoptera). Ent. news 36:180. 1925.

Five species of thrips are discussed, one new to this country, one probably new to science, one in greenhouses which is rather anomalous in the structure of its wings, one which causes galls on Cornus and which is probably a new species, and one which is reported for the first time from the United States.

- H. C. Hockett — A systematic study of the Anthomyiidae of New York, with especial reference to the male and female genitalia. Cornell Univ. Agr. Exp. Sta. Memoir 77. 1924.

This is a systematic study of a subfamily of flies containing important economic species. The cabbage maggot, the onion maggot, the seed-corn maggot, and the raspberry-cane maggot, are early stages of flies belonging to this group. A number of structural characters which will facilitate the recognition of the species, are described for the first time. Ninety-two species are included in the New York State fauna.

- D. A. Johannsen — Eye structure in normal and eye-mutant *Drosophila*s. Journ. morph. and physiol. 39:337-346. 1924.

This paper gives an account of the cellular structure of the compound eye in the normal individuals and in the eye-mutants of the fruit fly *Drosophila*. The study shows the eye of the normal fly to differ in minor details of structure from those of both the house fly and the blowfly. The eyes of the eye-color mutants differ from the normal eyes only in the amount and the distribution of the two pigments. The abnormal eyes of the mutants suggest an irregular growth of the cells of the pupal eye without a corresponding perfecting of the imaginal characters.

- A. E. Lundie — A biological study of *Aphelinus mali* Hald., a parasite of the woolly apple aphid, *Eriosoma lanigera* Hausm. Cornell Univ. Agr. Exp. Sta. Memoir 79. 1924.

This bulletin contains a discussion of the hosts and the distribution of *Aphelinus mali*, and details the life history of the species. The methods of rearing the tiny parasites are described also. The effect of the parasitism on the reproductive ability of the woolly aphid is discussed. Methods of preparing the material for shipment to South Africa are described, and notes on the successful emergence of the parasites in that country are included. An extended bibliography is given.

- R. Matheson — The genera of Culicidae of North America. Canad. ent. 17:157-161. 1924.

This paper presents a new key to the North American genera of Culicidae. New and more easily observed characters for separating the genera are described and figured. The separation of genera in this family is very difficult.

- R. Matheson — The Culicidae of the Douglas Lake region (Michigan). Canad. ent. 17:289-290. 1924.

This is a list, with notes on habits, of the species of this region. *Anopheles maculipennis* is recorded from this region for the first time.

- J. G. Needham — The male of the parthenogenetic mayfly, *Ameletus ludens*. Psyche 31:308-310. 1924.

The discovery of the male of this parthenogenetic species is described, and notes on the life cycle of other Ephemerida are included.

- J. G. Needham — Some aquatic neuropteroid insects of Lake George. Ent. news 36:110-116. 1925.

This paper gives a list, with ecological notes, of species collected at Lake George, New York.

- J. G. Needham — Entomology. Land-grant college education, Part III, chapter 8. U. S. Dept. Interior, Bur. Ed. Bul. 4:44-46. 1925.

A brief summary is given of the progress of entomology, especially in economic aspects, during the past decade.

- J. G. Needham and P. W. Claassen — A monograph of the Plecoptera or stoneflies of America, north of Mexico. Ent. Soc. America. Thomas Say Foundation Monographs, 2:397. 1925.

This paper presents a systematic review of the order Plecoptera in North America, north of Mexico, with complete descriptions of the known species, keys to families, genera, and species, and illustrations of every species. It is a comprehensive work containing the results of thirty years of collecting and study.

- E. F. Phillips — The bee-louse, *Braula coeca*, in the United States. U. S. Agr. Dept. Circ. 334. 1925.

An account is given of the outbreak of this parasite of honeybee colonies in Maryland and Pennsylvania, with a discussion of the damage done by it in other countries in which it occurs.

- E. F. Phillips — The status of Isle of Wight disease in various countries. *Journ. econ. ent.* 18:391-395. 1925.

The present geographical distribution of the mite causing the Isle of Wight disease is summarized, and the damage done by the insect is discussed. The quarantine measures adopted by the United States are also discussed and are compared with similar measures taken by other countries.

- E. F. Phillips — L'abeille a-t-elle livré tout son secret? *Gazette apicole* 25, 238:205. 1924.

This paper discusses the present status of investigations of bees, with emphasis on the paucity of our present knowledge of these insects.

- E. F. Phillips — "Degeneration" der bienen und "spontanes" Auftreten gutartigen Faulbrut (Sauerbrut). *Schweiz. Bienen-Ztg.*, N. F. 48³⁻⁴:1-8.

- E. F. Phillips — "Degenerescence" et "présence spontanée" du couvain pour l'Européen. *Soc. Apicult. Alpes-Maritimes. Bul.* 3:18:34-39. 1924.

This paper offers a reply to the suggestion which has been made by certain European investigators, that the organism causing European foulbrood is widely scattered in nature, together with an explanation of the reasons for this misinterpretation of the facts known about the disease.

- E. F. Phillips — Le api italiane negli Stati Uniti. *Apicoltura Ital.* 20:281-284. 1924.

A short history is given of the introduction of the Italian bee into the United States, and also an account of the reasons why it has superseded other races of bees among commercial beekeepers of this country.

- E. F. Phillips — The Seventh International Apicultural Congress. *Journ. econ. ent.* 18:441-445. 1925.

A general account is presented of this Congress, at which the writer acted as delegate for several organizations of the United States and for the Federal Government.

- E. F. Phillips — Some changes in European foulbrood control. *State Apiarist Iowa. Report for 1924* (issued in 1925).

Emphasis is laid on the methods of prevention which have been developed for European foulbrood through the results of more recent investigations.

- E. F. Phillips — A source of confusion in the investigation of diseases of adult bees. *Internat. Apicult. Cong. Proc.* 7. 1924.

The weakness of many colonies of bees is shown to be due not to infectious diseases but to poor beekeeping management, and the confusion caused among pathologists by this condition is outlined.

- L. P. Wehrle — A study of the segmentation of the antennae of the clover-flower midge (*Dasyneura leguminicola*, Lintner). *Ent. Soc. America. Ann.* 17:416-418. 1924.

This paper reports a study of the number of segments in the antennae of *Dasyneura leguminicola*. The number of segments in the antennae varied from thirteen to seventeen, the commonest number being sixteen in both sexes. The two antennae of an individual may have an equal or an unequal number of segments. A certain lack of definiteness in segmentation was noted.

- L. P. Wehrle and P. S. Welch — The occurrence of mites in the tracheal system of certain Orthoptera. *Ent. Soc. America. Ann.* 18:35-44. 1925.

A tarsonemid mite belonging to a new genus and a new species is discussed. This mite, which has been described and named *Locustacarus trachealis* by Dr. H. E. Ewing, normally inhabits the tracheal system of certain grasshoppers, and is thus far known to occur only in the vicinity of Manhattan, Kansas. The striking similarity existing between *Locustacarus trachealis* and *Acarapis woodi* (the mite causing Isle of Wight disease in the honeybee in Great Britain) is discussed.

The following papers have been accepted for publication and are in press:

- O. A. Johannsen — A new sciarid from the eastern United States.
O. A. Johannsen — *Orthocladius* (*Psectrocladius*) *spinifer*.
O. A. Johannsen — *Beris quadridentata* Walker.
O. A. Johannsen — Synonymical notes on some New York State Chironomidae.
O. A. Johannsen — Notes on Walker's species of North American Mycetophilidae.
O. A. Johannsen — The genus *Trichotanypus* Kieffer.

Forestry

In the Department of Forestry the following paper has been published:

- A. B. Recknagel — Notes on growth of red spruce in Franklin County, Maine. Journ. forestry 22:810-811. 1924.

This article deals with the results of a study of current annual increment of red spruce (*Picea rubra*) in Maine. Two tabulations are presented. The first table shows the local heights and the cubic-foot volumes, by inch-diameter classes, for trees from six to twelve inches in diameter. The second table shows the number of years required to grow the last inch, and the corresponding current annual increment per cent, by inch-diameter classes, for trees from six to twenty inches in diameter.

Plant Breeding

In the Department of Plant Breeding the following papers have been published:

- M. Demerec — A case of pollen dimorphism in maize. Amer. journ. bot. 11:461-464. 1924.

It is shown in this paper that reserve carbohydrates of starchy maize stain blue with iodine, and those of waxy maize stain reddish brown. Hybrids between starchy and waxy maize produced pollen, about fifty per cent of which stained blue and fifty per cent reddish brown, thus demonstrating visually the 1:1 segregation of a genetic factor pair in germ cells.

- M. Demerec — Genetic relations of five factor pairs for virescent seedlings in maize. Cornell Univ. Agr. Exp. Sta. Memoir 84. 1924.

The existence of five genetically distinct virescent seedlings in maize is demonstrated. The several types are described, and their relation to environmental factors is noted. The linkage relations of two of the five types are shown.

- Paul Kvakan — The inheritance of brown aleurone in maize. Cornell Univ. Agr. Exp. Sta. Memoir 83. 1924.

A new aleurone character, brown color, is described, its relation to other aleurone colors is noted, and its linkage relations are shown.

- H. H. Love — The contribution of genetics to the field of crop production. Amer. Soc. Agron. Journ. 16:614-626. 1924.

This paper points out some ways in which the science of genetics has been of service in the practical work of crop improvement. Improved and efficient methods for use in practical improvement projects have been developed from genetic experiments conducted to demonstrate the truth regarding certain hypotheses. Attention is called to the value derived from studies involving hybridization of varieties and of species in regard to the mode of inheritance of such characters as disease resistance and earliness. The knowledge regarding heterosis may be of practical importance. Some problems of crop improvement which require a genetic attack are suggested.

- H. H. Love — The rôle of statistics in agronomic experimentation. Sci. agr. [Canada] 5:84-92. 1924.

In this paper the writer deals with the probable error — its definition, methods of use, and value. A plea is made for an extensive use of this method in agronomic experimentation.

- H. H. Love and W. T. Craig — Results of experiments with oats in New York. Cornell Univ. Agr. Exp. Sta. Bul. 436. 1925.

The results of oat trials conducted from 1914 to and including 1922, with a report on the more important strains tested to and including 1924, are given. Cornelian is shown to be the outstanding variety so far as yield is concerned. The possibilities of gain through selection are shown. Early oats give a lower yield than do the medium-season or late sorts. A comparison of the yields of the side- and spreading-panicle types show the latter to be the better type for New York conditions. Correlation between yield per acre and weight per bushel for several years emphasizes the fact that high weight per bushel does

not always indicate high yield per acre. Percentage of meat for several of the better-known varieties and strains is given. Of these, Cornellian has the highest percentage of meat. A rate-of-seeding test shows that for ordinary use $2\frac{1}{2}$ bushels per acre of well-cleaned seed will be sufficient.

- C. H. Myers — Cooperation between seedsmen and agricultural experiment stations in the production and distribution of better seed. Amer. Seed Trade Assoc. Proc. 42:70-81. 1924.

This is a plea for closer cooperation between the seedsmen and the experiment stations. An effort is made to define the functions of these two agencies and to show in what way they may work together in the production and distribution of better strains of seed.

- C. H. Myers — How to improve the yield and quality of seed potatoes by selection and to maintain such improvement. Potato Assoc. America. Proc. 11:3-14. 1924.

This discussion is limited almost entirely to the possibility of improving the yield of potatoes by selection, because of the difficulty of definitely determining quality. Since possibility of success by selection depends upon the frequency and the nature of bud mutations which may occur, the writer reviews the evidence that is available concerning this point. The results of his own experiments extending over a period of ten years, are presented as confirming the conclusion that bud mutation is of considerable importance. The necessity of differentiating between strains and varieties is also stressed, and it is suggested that a subdivision of varieties into their component parts is of great importance to the seed-potato grower. To accomplish such a subdivision, careful methods of making comparative tests are essential, and specific recommendations are made, based on the author's own experiments, which are in general confirmed by other workers who have studied this problem. The limits of improvement by selection are definitely recognized and pointed out. But, in the author's opinion, the success that may be attained is sufficient to justify the general application of the hill-unit method, and he suggests that certification standards should include points with reference to the ancestry of the stock certified.

- Helen Trajkovich — Inheritance of xantha seedlings in maize. Cornell Univ. Agr. Exp. Sta. Memoir 82. 1924.

A new seedling-chlorophyll deficiency in maize is described and its mode of inheritance is discussed.

- R. G. Wiggins — Experiments in crop rotation and fertilization. Cornell Univ. Agr. Exp. Sta. Bul. 434. 1924.

The experiments reported in this bulletin include all the data obtained from 1914 to 1921, inclusive. At the end of that period, work on the plots was discontinued. The series of plots were planned to demonstrate the ordinary principles of rotation, and at the same time to make a study of the effect on yield of continuous cropping, of alternate grains, and of grass, clover, or a cultivated crop in the rotation. Each system was studied under three conditions: without the use of any fertilizer, with the addition of a complete fertilizer, and with the addition of a complete fertilizer and manure. The period of time, although rather short, extended over two complete rotations in all cases, and permitted a comparison of each crop in the rotation with the same crop in any other rotation where it occurred each year of the experiment because by triplication each crop in the three-years rotations occurred each year. The fertilizer used was such as is suitable for the crop to which it was applied, while the amount of manure used was approximately the amount which would have been produced according to Heiden's formula if the crop had been fed to cattle. The method of analysis of results employed in this paper is the so-called Student's method which permits of pairing of individual yields in all comparisons for each year thus giving weight to the amount and the consistency of differences in estimating the significance of the mean difference. Seasonal differences which enter so largely in the final expression of the probable error when calculated by Bessel's or by Peter's formula affect very little the final results as determined by Student's method and expressed in odds. Detailed calculations for two complete comparisons are given as an appendix to the bulletin. The results show the effect on yield of continuous culture and of alternate grains as compared with a rotation, the effect of a cultivated crop in a rotation as compared with a rotation

without a cultivated crop, the effect of a legume as compared with grass, and the effect of fertilizers and manure on the maintenance of crop yields in a rotation.

The following paper has been accepted for publication as a memoir of the Experiment Station:

R. G. Wiggins — Variations within and between morphological varieties of oats and barley.

Plant Pathology

In the Department of Plant Pathology, the following papers have been published:

W. H. Burkholder — Variations in a member of the genus *Fusarium* grown in culture for a period of five years. Amer. journ. bot. 12:245-253. 1925.

Morphological and physiological changes take place when *Fusarium martii phaseoli* is grown in pure culture for a considerable length of time. The extent of these changes is noted and discussed, and the variability of members of this genus is pointed out. Inoculating a bean plant with the fungus, and reisolating after infection has taken place, brings back to a certain extent the original characters.

C. Chupp — Manual of vegetable garden diseases. (Book, published by The Macmillan Company.) 1925.

This manual deals with more than three hundred diseases of vegetables. The hosts are placed in alphabetical order. Each disease is discussed with the following topics in mind: distribution, history, hosts, varietal susceptibility, symptoms, cause, ecology, control, and principal citations. The last two chapters deal with fungicides and soil sterilization. Certain new matter, resulting from researches of the author, is included. A glossary is appended.

H. W. Fitch — Some promising new features in dusting. New York State Hort. Soc. Proc. 70:174-182. 1925.

Here are presented some of the more important findings of the past three years of work by the author as Herman Frasch Fellow in Plant Pathology. A search was made for more effective materials and combinations for the control of fruit diseases. Precipitated sulfur, copper carbonate, sulfur-cresol, and sulfur-malic acid mixtures, gave promise in the control of apple scab. Soluble sulfur, copper carbonate, copper lime, and dry lime-sulfur dusts, all gave commercial control of peach leaf-curl in both spring and fall treatments. Sulfur-lead dust, lime-sulfur spray, and bordeaux mixture, gave satisfactory control of quince leaf and fruit spot, while copper-lime dust gave very poor results.

L. O. Gratz — Wire stem of cabbage. Cornell Univ. Agr. Exp. Sta. Memoir 85. 1925.

Wire stem, or damping-off, of cabbage is shown to be caused by a strain of *Corticium vagum* B. & C. physiologically distinct from the strains causing lesions on potato stems. Practically any combination of soil temperatures and moistures favorable for the growth of the host is favorable for the growth of the fungus and for the development of the disease.

E. F. Guba — Pathologic histology of apple blotch. Phytopathology 14:558-568. 1924.

The pathological histology of diseased twigs, pedicels, fruit, and foliage is described in considerable detail. There is included also some discussion of correlated symptoms.

R. S. Kirby — The take-all disease of cereals and grasses caused by *Ophiobolus cariceti* (Berkeley and Broome) Saccardo. Cornell Univ. Agr. Exp. Sta. Memoir 88. 1925.

The first authentic report of take-all in this country was from New York State in 1920. The disease has long been known in Europe, Japan, and Australia. Since the time of its discovery in New York the author has studied the disease in the field and the greenhouse, and this paper presents the results of his investigations. The life history of the pathogene has been studied, its pathogenicity determined, and certain phases of its physiology investigated. Indications are that the disease may be held in check by crop rotation, possibly supplemented by growing resistant varieties of wheat in areas where the disease is most severe.

- A. G. Newhall — Dusting celery seedbeds to control blights. (Abstract.) *Phytopathology* 15:50. 1925.

Increases in yield of celery, of from 25 to 100 crates per acre, have been obtained by dusting the seedbed or by locating it on new muck to insure blight-free plants for transplanting. From two to four applications of 20-80 copper-lime dust were made at about weekly intervals before transplanting. The diseases concerned were bacterial blight (*Pseudomonas apii*) and late blight (*Septoria apii*).

- A. G. Newhall — Studies on the tip burn disease of lettuce. (Abstract.) *Phytopathology* 15:58. 1925.

An investigation has been made of the relation of certain fertilizers, temperature, sunshine, and soil moisture, to this disease under field and greenhouse conditions, using Big Boston head lettuce. Osmotic pressure and catalase activity also have been studied. It is concluded that the disease is not of bacterial origin, though bacteria may play an important secondary rôle. Fluctuations in temperature and in moisture supply, particularly in the presence of readily available potassium and nitrogen, induce tip-burn. Conversely, slowing down the rate of growth by leaving potash out of the fertilizers and root-pruning or deep cultivation at the proper time, has reduced the amount of the disease. Slow-growing varieties of head lettuce were found to be less subject to tip-burn than were other varieties.

- H. E. Thomas — Root and crown rot of apple. *New York State Hort. Soc. Proc.* 70:171. 1925.

A brief summary of causal factors, and suggestions for control, are presented.

- H. H. Whetzel and J. M. Arthur. The gray bulb-rot of tulips caused by *Rhizoctonia tuliparum* (Klebh.) n. comb. *Cornell Univ. Agr. Exp. Sta. Memoir* 89. 1925.

The authors present what appears to be the first report of this disease in America. The disease has long been known in Europe, particularly in Holland and Germany. A rather full and complete review of the European literature on the subject is presented. The symptoms of the disease are described and illustrated. A careful study of the pathogene, with respect to both its cultural character and its morphology, indicates that it should be placed in the genus *Rhizoctonia*, and the transfer to this genus is made. Experiments on the control of this disease, covering two seasons, are reported. These indicate that the trouble may be satisfactorily controlled by the standard methods of soil disinfection, especially the use of formaldehyde and steam. An extensive bibliography of the subject is appended.

- H. H. Whetzel, Lex R. Hesler, C. T. Gregory, and W. Howard Rankin. *Laboratory outlines in plant pathology*. (Revised ed.) (Book, published by W. B. Saunders Co.) 1925.

This is a laboratory guide or manual for university students in an elementary course in plant pathology. Outlines of some fifty diseases are presented, covering a wide range of crops. These outlines are the results of some fifteen years of continuous experience in the teaching of plant pathology in the College of Agriculture at Cornell University. The outlines are completely revised and rewritten, and present the senior author's present conception of the best method of presenting such material to students in the laboratory. A number of new terms are introduced into the terminology of plant pathology.

- H. H. Whetzel, H. S. Jackson, and E. B. Mains. The composite life history of *Puccinia podophylli* Schw. *Journ. agr. research* 30:65-70. 1925.

This paper constitutes what appears to be a fundamental contribution to our knowledge of the life history of this rust, and embodies the work of the authors covering a period from 1916 to 1921. The authors conclude from this investigation that: (1) *Puccinia podophylli* shows no evidence of being perennial or systemic in the host; (2) the early crop of teliospores which occur on the bud scales, stems, and sepals preceding the aecia, arise directly from mycelium produced by basidiospores from overwintered teliospores, and are usually not accompanied by pycnia; (3) the aecia which normally develop on the blade of the leaf also arise in a similar manner from the same source; pycnia are usually found associated with the aecia; (4) the late, or summer, crop of telia are produced on mycelium developed from infection by aeciospores; (5) there is no evidence of repeating aecia in this species; (6) basidiospores from either the early or the late crop of teliospores may result in the production of either the early telia or

the aecia; (7) telia may develop in association with the aecial lesions and arise directly from the same mycelium; (8) when mature leaves are infected, telia may predominate over the aecia, with or without the development of pycnia; (9) *Puccinia podophylli* exhibits evidences of being in an unstable or plastic condition as to life history; (10) it is suggested that the food conditions of the various tissues invaded have an important influence on the spore form developed; (11) this species is believed to be a form which still exhibits evidences of the sort of changes that may take place in the evolutionary development from the complex to the simpler forms of life history.

The following papers have been accepted for publication and are in press:

- H. W. Fitch — Quantitative determination of sulfur fungicides on foliage.
- E. F. Guba — Literature on fungus floras in North America, and an addition to the check list of references dealing with the taxonomy of the fungi.
- C. V. Kightlinger — Preliminary studies on the control of cereal rusts by dusting.
- A. L. Pierstorff — Control of aphids on nursery stock.
- H. E. Thomas — Apple blotch in New York.
- R. A. Toro — New or noteworthy Porto Rican Pyrenomycetes.

The following papers are ready for publication:

- O. C. Boyd — Investigations of the relative efficiency of some copper fungicides in the control of potato diseases and insect pests.
- H. W. Dye — Two diseases of western New York lettuce: the bottom-rot and the stunt.
- E. F. Guba — The genus *Pestalotia* — a preliminary consideration of classification.
- K. H. Fernow — Interspecific transmission of mosaic diseases of plants.
- R. S. Kirby — Diseases of cereals.
- D. S. Welch — A monographic study of the genus *Cucurbitaria* in North America.
- H. H. Whetzel and F. D. Kern — The rusts and smuts of Porto Rico. In *Flora of Porto Rico and the Virgin Islands*, by N. L. Britton and Percy Wilson.
- H. H. Whetzel and F. D. Kern — Some new and interesting rusts from Porto Rico.
- H. H. Whetzel and F. D. Kern — A report on the rusts of Porto Rico collected by H. H. Whetzel, F. D. Kern, and R. A. Toro.

Pomology

In the Department of Pomology, the following papers have been published:

- D. B. Carrick — Some effects of freezing on mature fruits of the apple. Cornell Univ. Agr. Exp. Sta. Memoir 81. 1924.

This memoir reports some studies on the freezing points of apples, the determinations of which are made by a potentiometric apparatus. The extreme variation in freezing points of 1552 determinations in ten apple varieties ranges from 26.87° F. to 30.16° F. The killing point of the tissue was found to be from 1.8 to 5.4 degrees lower than the initial congealing point. Rapidly frozen apples are more severely injured than are slowly frozen ones, but the rate of thawing is of no significance except when the thawing is prolonged for several days or weeks, in which case there is greater injury. Comparisons of the freezing points in normal apples, in tissue frozen to death, and in the expressed cell sap, are given. Various external and internal symptoms of frozen apples, such as changes in color, the effect of bruising while ice is still present, and the texture and flavor, are described. The storage quality of frozen apples is briefly mentioned, and suggestions are made regarding the optimum storage temperature for this fruit.

- T. L. Lyon, A. J. Heinicke, and B. D. Wilson — The relation of soil moisture and nitrates to the effects of sod on plum and cherry trees. Cornell Univ. Agr. Exp. Sta. Memoir 91. 1925.

This experiment was carried on in cooperation with the Department of Agronomy, and is reviewed in the report of that department.

The following papers are ready for publication:

- D. B. Carrick—The effect of freezing and low non-freezing temperatures on the respiration of mature apple fruits.
 D. B. Carrick—Some studies on the freezing points and cold storage of *Vinifera* grapes.
 Francois J. deVilliers—The effect of low temperature on the mature pear fruit.
 A. J. Heinicke—The toxic influence of grass on the growth of apple trees.
 F. S. Howlett—The nitrogen and carbohydrate composition of the developing flowers and young fruits of the apple.

Rural Education

In the Department of Rural Education the following papers have been published:

- J. E. Butterworth—Defining the local rural school unit in terms of its objectives. *Ed. admin. and supervis.* 11:145-156. 1925.

This paper analyzes the needs that should be met by the local school unit, and presents two major objectives that should be set up for such a unit. These are: (1) to provide the physical resources necessary for maintaining effective schools; and (2) to so combine individuals and groups that the development of educational activity is facilitated because of a stimulating utilization of the educational interests of those individuals and groups. Various types of existing local units are evaluated in terms of these objectives, and data are presented from eight States showing the extent to which the town and the township meet certain requirements set up.

- J. E. Butterworth—Educational resources of country life. *Journ. rural ed.* 4:6-13. 1924.

There are here set up five types of conditions in country life which, in general, work favorably for the education of the child. Some data are given, and the important implications of these resources for the school are set forth.

- T. H. Eaton—A study of teaching in the college of agriculture. *Nat. Soc. Coll. Teachers Ed. Proceedings.*

This is an observational study of the activities of instructors and students in class hours during one semester at the New York State College of Agriculture.

- E. N. Ferriss—The rural high school: its organization and curriculum. *U. S. Dept. Interior, Bur. Ed. Bul.* 10. 1925.

This paper presents an analysis, made largely on the basis of statistical material, of the rural high school as to (1) its internal organization, (2) its cooperative relationship with the community organizations, (3) the nature and extent of its extraclass activities, and (4) the nature and variety of the curriculums. Such other problems are considered as have an important bearing on these four main problems. The rural high school, in the study, was defined as one in which fifty per cent or more of the pupils were from farm homes. The data were obtained largely from two sources: (1) from the visitation by the author of 54 rural high schools distributed over 18 States; and (2) from replies to questionnaires received from 231 principals of rural high schools representing 47 States. Additional information was gathered from recent reports and bulletins issued by state departments of education, from bulletins of the United States Bureau of Education, and from special studies by various individuals of certain phases of the work of small high schools. Throughout the study comparisons are made with other small high schools. Particular reference is made to a group of 125 high schools, representing 41 States, enrolling from ten to forty-nine per cent of their pupils from farm homes and designated as semirural high schools.

- E. N. Ferriss—Curriculum problems of the small high school. *The high school teacher*, 1:103-104, 135. 1925.

- P. J. Kruse—Educational achievement, Part I. (Printed as vol. 4 of the Texas educational survey report.) 1925.

A study of the educational achievement of various groups of pupils in the public schools of Texas is here reported.

- F. Pittenger and G. A. Works—Financial support. (Printed as vol. 2 of the Texas educational survey report.) 1925.

This is an analysis of the present methods of raising and distributing funds in Texas for the support of the public-school system.

- A. Works and others—Organization and administration. (Printed as vol. 1 of the Texas educational survey report.) 1925.

An analysis is given of the present administrative organization of schools in Texas, with suggestions for modification.

The following papers are ready for publication:

- E. Butterworth—Factors involved in defining rural education for purposes of administrative organization.
E. Butterworth—Types of county control of education in the United States.

Vegetable Gardening

In the Department of Vegetable Gardening the following papers have been published:

- V. Hardenburg—Soil type as a factor in seed potato production. Potato Assoc. America. Proc. 11:95-101. 1924.

This paper is a preliminary report of the results to date from a four-years study of the influence of soil type *per se* on potatoes grown for seed purposes. Certified seed of the Green Mountain, Rural, and Irish Cobbler varieties was planted on six types of soil, two each in Onondaga and Wayne Counties and at the experiment station at Ithaca, in 1923. Muck and upland soils were compared in the two counties named, while both heavy and light upland soils were compared at Ithaca. One-eighth-acre plots of each soil type were used. Data on height of plant, number of stalks to the hill, number of tubers to the plant, and average weight of tubers, were taken at midseason, and total and marketable yields were recorded at harvest time. In every instance, the number of stalks to the hill and the number of tubers to the plant were highest in the lighter soil. Contrary to popular opinion, the eating quality of both muck- and peat-grown tubers was higher than that of tubers grown on the upland soils. Random samples of tubers from each of the six soil types were stored for comparison in 1924. Duplicate lots were tested in 1924, both at Ithaca and at the vegetable research farm at Riverhead. Only in the case of the muck- and the peat-grown seed was any difference noted in the time of coming up. Although these lots came up slightly earlier, the difference was outgrown later in the season. Tuber set and yield were directly correlated, and, with but one slight exception, tuber set and yield were highest from the seed produced the previous year on the lighter soils. Since six comparisons were made, there is considerable evidence not only that soil type influences tuber set and yield, but also that these influences are transmitted through the seed to the crop of the succeeding year. Plantings of the Green Mountain and Rural varieties, similar to those made in 1923, were again made in 1924 in Wayne County and at Ithaca for test in 1925. Data taken both at midseason and at harvest were in entire accord with those for 1923.

- V. E. Loomis—Some problems in the analysis of horticultural material. Amer. Soc. Hort. Sci. Proc. 1924:365-370. 1925.

This paper points out the convenience and the theoretical suitability of 80-per-cent alcohol for preserving and extracting plant tissues for analysis. A separation of colloidal and noncolloidal nitrogen by extracting with alcohol is proposed as more conducive to comparative results than the water-extraction method rather generally advocated for determining "soluble" nitrogen. Data are given which show the effect of moisture in reducing the recovery of nitrate salts by the official salicylic-acid method. This method also was found to be uncertain in its action on alcoholic plant extracts which contain, in addition to inorganic nitrogen, acid and basic organic compounds of this element. A modified double-distillation method employing Devarda alloy is recommended for such determinations.

- V. E. Loomis—Studies in the transplanting of vegetable plants. Cornell Univ. Agr. Exp. Sta. Memoir 87. 1925.

The wisdom of adopting garden practices which recognize degrees of resistance to transplanting is borne out by experimental data. Transplanting did not prove beneficial under constant spacing conditions, and was disastrous to legumes, corn, cucurbits, and similar crops handled under unfavorable conditions. Transplanting was not markedly injurious to small plants of vegetables commonly transplanted, but was injurious when large plants were moved. No top characteristics other than rate of growth could be definitely correlated with resistance to transplanting. The property of accumulating carbohydrates during hardening appeared to hasten new root formation when the hardened plants were transplanted, but it is questionable whether the gain will affect the growth losses due to hardening treatments. All observed differences in transplanting behavior could be correlated with rate of replacement of the roots lost in transplanting. This was equally true for inherent differences and for differences due to treatment. All vegetable plants have a relatively rapid rate of root replacement when in the seedling stage, and all can be successfully transplanted at this age. The ability to produce new branch roots decreases with age, but more rapidly with those plants which are considered difficult to transplant. Decreased root-branch formation was associated with suberin deposits in the outer layers of the roots.

- H. W. Schneck—Results of some experiments in pruning and training greenhouse cucumbers. *Amer. Soc. Hort. Sci. Proc.* 1924:121-126. 1925.

The results of experiments in pruning and training greenhouse cucumbers, covering a period of five years, indicate that the single-stem method of pruning, which allows little vine growth and requires close planting, produces less fruit per plant, and fruit of smaller size and poorer grade, than does the extension-stem system, which permits more vine growth per plant and requires wider spacing. On the other hand, the total yield, the early yield, and the amount of first-grade fruit, were greater per square foot of greenhouse area with the single-stem system, and the cost of pruning was the same. With decrease in top growth there was a marked decrease in root growth, but the total yield of fruit per unit of vegetative top growth was greater where the top growth was reduced by pruning.

- H. C. Thompson—Experimental studies of the effects of cultivation on certain vegetable crops. *Amer. Soc. Hort. Sci. Proc.* 1924:108-115. 1925.

This paper summarizes the results of six years of experiments at Ithaca with beets, carrots, onions, celery, cabbage, and tomatoes. Cultivation once a week was compared with scraping off the weeds at the surface of the ground with a sharp hoe without forming a soil mulch. In addition to these two treatments, the weeds were allowed to grow in certain plots of beets. All treatments were replicated three times. The only large and consistent gains for cultivation as compared with scraping to keep down weeds, were with celery and onions, where the gains were 23 and 10 per cent, respectively. With carrots the average difference was 5.5 per cent in favor of cultivation; with beets, 4 per cent; with tomatoes trained, 3.4 per cent; with tomatoes untrained, 2.5 per cent. With cabbage the average difference was 1.7 per cent in favor of scraping. The differences for these crops were not consistent and are easily within the range of experimental error. Weeds had a very marked effect on the yield of beets, the weed plots producing less than one-sixth as much crop as did the cultivated or scraped plots. In fact, the green weight of weeds and beets produced on the weed plots was less than the green weight of beets alone on the other plots. Results of soil-moisture determinations for four years show some conservation due to the soil mulch, but under some conditions the reverse was true. The differences were never great. Eliminating the weeds had a much greater effect on soil moisture than did the maintaining of a soil mulch. Records of soil temperature at depths of 3 and 5 to 6 inches for 1923 and 1924 show a slightly higher temperature in the scraped plots than in the cultivated plots throughout both seasons. This was true on both cropped and uncropped areas. Studies of the root systems of the crops used in these experiments show an apparent correlation between the extent and distribution of the roots, and the response of the crop to cultivation. The plants which had large and well-distributed root systems responded less to cultivation for the purpose of maintaining a soil mulch, than did the plants which had a small and restricted root system. There is less moisture conservation from cultivation with the former than with the latter plants.

THE STATE EXTENSION SERVICE

During the past year all branches of the extension service, including college subject-matter specialists, farmers' institute workers, county agricultural agents, home demonstration agents, and county club leaders, have given special attention to aiding agriculture to meet present economic conditions. No branch of the service is emphasizing increased production, as it was so necessary to do during the war; the matters receiving attention are economy of production, better marketing, development of better standards and grades of product, economies of labor and of other expense, and methods of securing to the producer a larger proportion of the price paid by the consumer.

The fall and winter of 1924-25 has witnessed the greatest lack of prosperity on New York farms that has existed during the past quarter-century. In spite of very serious economic conditions and a tremendous tax burden on real estate, the counties of the State have maintained the full complement of farm bureaus, have made appropriations for two new home bureaus, and have made temporary provision for one new county club agent, during the past year. This is an indication of the legislative foresightedness of the county boards of supervisors, and an indication also of the extent to which agricultural extension has been accepted and valued by the people of the State.

During the past year the average attendance at community extension meetings has increased materially over the two previous years and has practically equaled the attendance of war-time years. In spite of very bad weather conditions, the 1925 Farmers' Week was the third largest Farmers' Week ever held at the College, and exceeded in total attendance the Farmers' Week of 1924.

Each year the extension work of the College becomes more a part of the life of the rural people. In communities and in counties, and to some extent in the State as a whole, the program is formulated by and carried out by local farmers and homemakers. A well-developed committee system and an efficient local-leadership organization make this possible in many counties. The home bureaus have been especially successful in developing from their membership a large number of local leaders who carry on rather formal educational work in their own communities.

Less than ten per cent of New York's population now live on farms. Although New York is ordinarily one of the half-dozen most important agricultural States of the Union, yet its supreme position as an industrial State overshadows its very great importance in agriculture. For these reasons it is necessary that all groups working for the people of the open country should cooperate to the very fullest extent. Every effort is being made to bring all such groups into close cooperation. The county extension organizations are now old enough, and well enough established as educational agencies, so that each year brings a better understanding on the part of all the people as to just what are the possibilities and limitations of their activities. With this safeguard a considerable degree of cooperation with other agencies has grown up, and constant effort should be made to promote this cooperation in the future.

The following pages contain a more detailed report of the work of the several administrative offices and of the extension divisions of subject-matter departments.

Administration

Farmers' Week. Although beset on all sides with adverse economic and weather conditions, the eighteenth annual Farmers' Week, held February 10 to 14 inclusive, was a marked success. A thirty-inch fall of snow followed by extreme thaws, in addition to floods early in the month, undoubtedly closed traffic on most country roads. It was very noticeable that during the first of the week no visitors came by automobile, but by Thursday a number of cars were in evidence and by that night the registration had nearly reached that of previous years. When the last card was turned in on Saturday, the registration showed that 3623 persons had braved the elements and had dared to strain the family budget to attend Farmers' Week.

Although not all of those registering designated their occupation on the registration cards, 1015 named farming while 263 were associated in lines allied to agriculture, and 700 were homemakers. As would be expected, Tompkins County had the largest registration, with 745 registered from the rural districts of the county. Seneca County was second, with 177, and Tioga County was third, with 123.

The program was fairly similar to those of previous years, with emphasis on marketing. The exhibits of the various departments were especially good; this feature should be stressed another year, and more prominence should be given to it in the program. A few of the statewide cooperative business associations sent exhibits. These included the Dairymen's League, the Wool Growers' Association, the Federal Land Bank, the Potato Growers' Association, the Cooperative Fire Insurance Associations, and the Grange League Federation.

For the first time a Farmers' Week get-together luncheon was served. This was attended by 602 persons.

Junior Field Days. The Junior Field Days, held on June 24, 25, and 26, 1925, met the prophecies of a record attendance. There were 1450 registered, which was 449 more than in 1924. Monroe County had the largest delegation, with 206 present; Tompkins County was second, with 158; and Jefferson County was third, with 154. The program as arranged this year gave more time than heretofore for sight-seeing and side trips. The instructional part of the program was well balanced.

Junior Field Days present a wonderful opportunity, both to the youngsters who attend and to the University, especially the College of Agriculture. It is the pick of the farm boys and girls who are present usually for the first time. To many the impressions and inspirations received at this first trip result in a determination to follow up their local schooling with college, either a short course or a regular four-years course. At any rate, these boys and girls form the nucleus of our future rural citizenship, and it behooves the College to meet the opportunity and accept the challenge.

Indian extension. The year witnessed a striking change in methods of extension work with Indians, in that the service passed from a general type aimed at all the inhabitants of each reservation, to specific projects in cooperation with individual farmers. To a large extent the confidence of the councils and the people has been won, and the selection of some outstanding Indian farmers to carry on particular pieces of demonstrational work is a natural development.

The group-plot idea, however, was continued. The Tonowanda band Senecas in Genesee County grew, as a group, 20 bushels of seed potatoes, and worked the plot collectively. With the seed obtained, nearly every farmer planted good seed this spring for the first time in the history of the reservation. Seed was given to many on the reservation also for small garden plots, and the outlook is that this reservation will be able for the first time to sell a surplus. A community Ford truck has been in operation, to carry products to the Buffalo market. This also is an innovation in marketing. Strawberry acreage was increased, and some 500 hundred fruit trees were planted on this reservation. Two farms were given pure-bred hens, and eggs from these are being hatched throughout the reservation.

The other reservations have advanced nearly as rapidly during the year, and the movement has attracted the praise of white communities adjacent to "Indian country" to such a marked degree that the Indians are becoming very proud of their products and this has done much to establish better relationships. St. Regis Mohawks held their second fair. The grounds had been purchased and improved by the Indians, and twenty men with eight teams worked evenings for four weeks to put the grounds in shape. Attendance during the three days of the fair equaled that at any community fair held in northern New York. Demonstrational judging by college specialists and county agents, a survey and layout for the grounds, and an exhibit, were contributed by the Extension Service.

The fifty-second annual Six Nations Fair included a joint exhibit by the Extension Service and the Erie County farm and home bureaus. Farmers' picnics were held on the Tonowanda, Onondaga, Allegany, and Tuscarora reservations.

The Allegany reservation, in Cattaraugus County, made marked progress this year. Pasture-improvement demonstrations proved effective in bringing about changed practices, and great strides were made in poultry work. In cooperation with state, federal, and county agencies the Cornell Indian Board of this reservation conducted a complete tuberculosis-eradication campaign, and the work is progressing very satisfactorily. The infestation was heavy, but the Indians are buying clean replacements and working on an intensive campaign of education to keep clean.

The Tuscarora reservation, in Niagara County, has within three years been turned into a fruit-growing area, instead of a dairying section such as it has been since 1722 when this group located in western New York. Indians and white neighbors credit the College and the county bureaus with this change, but the returned short-course students have rendered equally as large a service. More than twenty-eight hundred fruit trees and forty thousand grapevines have been planted on this reservation within two years. As a result of two demonstrations in old-orchard management, fourteen farms have adopted improved practices. A spray service, handled by a short-course student and translated into Tuscarora language, is also a feature. Oat seed furnished by the College and grown by one farmer has become well distributed. Similar work with potatoes has been done.

Plans for spring and summer work were outlined by the Cornell Indian boards which met at Ithaca during Farmers' Week. In all the work the Indians are assuming a larger responsibility, are classifying the calls for service, and are surely forging forward with increased acreages on four reservations and making some progress on the other two reservations.

The outstanding new features of the service were, first, a drift toward an intensive personal farm service, and secondly, long-term demonstrations instead of seasonal or yearly ones. The agronomy demonstrations are in full force on four reservations, and yearly field meetings will be held on the sixteen plots included in these demonstrations to show the influence of lime and acid phosphate on successive crops. Seasonal demonstrations will be continued in some of the newer projects, but the fact that the Indians have reached a point where they are thinking in terms of long-term programs means much for the future of farming among them.

Loan of lantern slides. During the year 650 loans of lantern-slide sets were made. Reports were received from 310 borrowers indicating 599 showings before a total attendance of 26,000. The office now has 65 series of slides, with a total of 6843 slides, in the loan collection. Of the 65 series, 57 are accompanied by supplementary lecture notes prepared by specialists. Agricultural and other high-school teachers are the most frequent borrowers; but grange lecturers, rural pastors, county agents, and others evidently find the service a helpful supplement to their teaching. County agents and home demonstration agents are now able to procure all federal motion-picture films and slide series directly from Washington.

Radio. Through an arrangement with station WGY, short talks on various subjects were broadcast on the second Monday evening in each month during the year. The service has no subject-matter continuity, but it provides means for reaching potentially large audiences with timely discussions.

Research in extension methods. In tabulating the data collected in the extension surveys conducted in cooperation with the federal extension service, the records cards for 1225 farms were found usable. The results (published in Extension Bulletin 104, entitled *The Effectiveness of Extension in Reaching Rural People*), show the following significant facts: On 82 per cent of all the farms, improved practices had been adopted as a result of extension work; improved farm practices had been adopted on 77 per cent of the farms, and improved home practices in 30 per cent of the homes. More than 3600 changed practices were reported. Personal service was reported as having influenced 13 per cent of the improved practices, propaganda 45 per cent, demonstrations 27 per cent, and indirect methods 39 per cent. Meetings were reported in connection with 23 per cent of the changes, news service with 16 per cent, and bulletins with 14 per cent. The persons in touch with extension agents adopted 100 per cent more improved practices per farm than did those without such contacts.

A report was made on methods of reaching, through extension work, farm girls and boys from sixteen to twenty-one years of age who are out of school but are not yet settled in occupations; and a committee made

recommendations, including a tentative curriculum, on college preparation for extension service in agriculture and homemaking.

State Fair. The college exhibits at the State Fair were materially changed from those of 1923. No spectacular features were presented except the "Niagara Falls" of milk, which was a combined exhibit staged by the State Department of Farms and Markets, the New York Agricultural Experiment Station at Geneva, and the College. This showed by a representation of Niagara Falls the volume and importance of the milk industry in New York, and by working models the manufactured products of milk. Marketing, and particularly the importance of grading, were emphasized in both agronomy and vegetable-gardening exhibits; the former by showing some of the United States hay grades and the desirability of grading hay, and the latter by showing grades of potatoes, by demonstrations on grading, and by showing grades of lettuce and cabbage.

Some of the other exhibits from the College included one to demonstrate the importance of rearing chicks from purebred, high-producing parents; one presenting methods of inspection and certification of grains and grass seeds; one showing the results of the organized ten-years management of the college woodlots; and one showing methods for cleaning a dairy stable following a test which has given reactors.

The exhibit of the girls' and boys' club work and the junior demonstrations were unusually successful. The livestock exhibit of the junior project workers was exceptionally fine, and in a few cases the juniors won in the open senior classes.

Town and county fairs. The calls from county fairs for demonstrational judging are increasing. During the fall of 1924 the College provided 105 specialist man-days at 42 fairs in 35 counties. Premium-list revision, in accordance with the recommendations of the college committee working on that matter, has been made, to an increasing degree, a prerequisite to obtaining a judge from the College. As a result, "string men" are finding it more difficult to win so much of the prize money, and local producers are taking a greater interest in exhibits. On the whole, very satisfactory progress has been made in improving the character of county-fair exhibits during the past few years.

Extension schools. For several years there has been a trend toward shorter schools, the three-days meeting being the most popular. During the winter of 1924-25 a total of 33 schools were held in 19 counties. Of these schools, 6 were of two-days duration, 14 of three days, 9 of four days, and 4 of five days. In practically all cases, two instructors are required: but three tractor schools for which the manufacturers provided part of the instruction (without any sales propaganda) needed only one instructor from the College. The various subjects taught at the extension schools, and the number of days for each subject, were as follows: agronomy, 5; animal husbandry, 10; entomology, 7; farm management, 15; marketing, 12; plant pathology, 8; pomology, 9; poultry, 37; rural engineering, 95. The total enrollment was 1023, the average enrollment was 31, and the average attendance per session was 23.4.

It should be pointed out that although the amount of extension teaching reported under the head of extension schools has gradually declined, the extension-school method has in fact steadily grown in usefulness. Exclu-

sive of farm and home institutes, which are designed to meet the need for preliminary or elementary instruction, a large proportion of one-day meetings, as now being given, are essentially schools in that method demonstrations and supervised practice, in which all persons attending participate actively, characterize the instruction given. Such, for example, are the sewing-machine schools, the one-day shop schools, the dramatics schools, the recreation schools, certain of the marketing schools, and other meetings.

Lectures and demonstrations. During the months of December, January, February, and March, both county agents and specialists devote the major part of their time to meetings, for the purpose of presenting results of field demonstrations conducted during the preceding growing season, of starting new projects, and of generally furthering the educational program. The type of meeting varies from the five-days school to the brief one-session committee meeting; but by far the largest number are all-day community meetings, offering special programs for men and women and generally including one joint session. Instruction at these meetings ranges from the elementary and inspirational type, which chiefly characterizes the farm and home institutes, to the highly technical discussions required with certain specialized groups. The table facing this page shows the volume of teaching efforts.

Farm bureaus

Farm bureau associations are maintained in the fifty-five New York counties that are conducting organized extension work. Each county association has its executive committee, which is the administrative body of the organization. Certain farmers in the various communities make up the community committees which cooperate with county agents in making and carrying out the extension programs. The community committeemen in the State comprise a body of about twenty-five hundred men. They are as a group the best farmers in the State, and are giving their time and thought freely to the carrying-out of a program of agricultural extension. County project committees function where their services can be helpful in furthering the execution of county-wide or sectional pieces of extension work. Well-prepared plans are made in each county, and all the resources available are used to carry them out. One new method which is being employed is the campaign method. This may be illustrated by the alfalfa campaign which was started in four counties—Livingston, Orleans, Monroe, and Seneca. The work is successful, and another group of counties is now being organized along the same line.

How a relatively unimportant project may grow to large proportions when actively taken hold of by the farm bureaus may be illustrated by the work in woodchuck eradication. During May and June, 1925, in cooperation with the United States Biological Survey, 350 demonstrations were held and were attended by 3877 farmers. It is impossible to accurately estimate the number of woodchucks eradicated or the value of the crops saved from destruction.

In 1924 there were 28,398 paying farm-bureau members in the State. At the time of writing this report, 28,503 farmers have paid their due for 1925. While this increase is not large, it is significant that the decline

SUMMARY OF EXTENSION SPECIALISTS' FIELD ACTIVITIES FROM JULY 1, 1924, TO JUNE 30, 1925

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Num-ber of farm and home visits	Conferences		Lectures		Miscellaneous (number of days)	Number of teaching contacts
		Num-ber	Attend-ance	Num-ber	Attend-ance	Num-ber	Attend-ance		Num-ber	Attend-ance	Num-ber	Attend-ance		
Agricultural Economics.....	290	12	248	68	991	....	....	163	43	298	256	11,448	25	13,130
Agonomy.....	405	2	16	60	1,232	....	....	1,017	81	1,217	335	9,015	24	12,497
Animal Husbandry.....	433	190	6,614	36	434	2	21	267	67	890	243	7,345	43	15,580
Dairy Industry.....	218	60	188	..	..	..	..	76	101	613	41	6,557	54	7,434
Entomology.....	300	80	1,011	69	1,109	1	14	214	120	408	137	15,087	35	17,843
Floriculture and Ornamental Horticulture.....	77	15	422	11	949	....	....	59	56	288	61	3,716	5	8,425
Forestry.....	110	11	306	7	280	1	20	121	45	235	33	1,878	7	2,840
.....	216	4	80	21	532	....	....	467	39	142	4	229	50	1,450
.....	225	31	787	..	..	....	....	545	55	489	122	5,691	30	7,512
.....	161	105	1,749	32	330	....	....	174	14	108	71	5,183	11	7,544
.....	719	456	11,213	....	..	....	..	769	45	465	439	13,229	96	25,076
.....	26	..	..	..	..	9	50	....	4	600	20	4,048	2	4,698
.....	464	683	12,236	102	1,056	2	12	248	20	180	6	211	5	13,943
.....	264	6	753	32	1,785	303	5,821	2	19	220	90	5,860	8	14,441
.....	328	11	248	8	157	7	75	238	67	400	455	27,179	59	28,297
.....	47	3	75	..	..	..	..	1	6	6	53	2,533	1	2,615
Total agriculture.....	4,283	1,669	35,946	446	8,855	325	6,013	4,354	782	6,568	2,366	119,200	455	180,943
Home Economics.....	1,051	89	4,374	60	1,864	723	10,740	128	542	1,845	433	16,539	30	35,490
Total specialists.....	5,334	1,758	40,320	515	10,719	1,048	16,753	4,482	1,324	8,413	2,799	135,748	485	216,435
Total administration.....	1,664	....	....	....	..	194	4,870	....	2,627	14,182	678	75,663	171	94,715
Grand total.....	6,998	1,758	40,320	515	10,719	1,242	21,623	4,482	3,951	22,595	3,477	211,411	656	311,150

in membership which began in 1919 has been checked. Farmers have gone through a very serious economic depression since the World War. This depression affected the organization, but the requests for service by individual farmers from the extension service has increased. During 1925, twenty-nine counties increased their farm-bureau membership over the 1924 figures. Thus the trend is upward.

There has been some tendency toward a reduction in the amount of the membership fee. In 1924, twenty-five counties maintained a fee of \$5; one county had a fee of \$4, twenty-three had a fee of \$3, and six had a fee of \$2. Six counties lowered their fee from \$5 to \$3.

In 1924, county boards of supervisors appropriated \$209,413 for the support of county-agent work. In 1925, up to the present writing, \$212,784 has been provided from this source. Public officials in all the fifty-five counties recognize the fundamental nature and value of the work and are continuing their support.

Membership fees in 1924 furnished \$105,845.64, which is about half the amount received from county boards of supervisors. Farmers are showing their appreciation of the work by making a large contribution to the budget. Including all funds—state, federal, and county—it cost \$507,348.44 to finance the work in 1924, an average of \$9224.52 per county. State and federal funds amounted to \$73,459.70.

In 1924 the fifty-five county agents spent 6034 days in their offices and 10,163 days in the field. They sent out 4681 circular letters, with a total circulation of 834,009. They prepared for the press 6353 articles. The number of personal letters written was 101,884.

Farmers are making increased use of the county offices. In 1924 there were 53,945 office calls handled by the agents. The demand for personal service is indicated by the fact that 24,714 visits to farms were made. Farmers cooperated in planning and carrying out the work through attending 972 project committee meetings, at which the total attendance was 9638.

A total of 893 demonstration meetings were held, with an attendance of 20,139. Project meetings numbered 4029, with an attendance of 227,744. In addition there were a large number of miscellaneous meetings. The cooperation with other agricultural agencies, such as the Dairy-men's League, the Grange, and breeders' clubs, was excellent.

Home bureaus

The fiscal year 1924-25 closes with thirty-seven county and three city home bureaus in operation, while the thirty-eighth county, Yates, is organized and financed to start as a full-fledged home bureau on July 1, 1925. The home bureau in St. Lawrence County was added on January 1, 1925. Two other counties, Livingston and Franklin, have developed the membership organization but have not yet secured their county appropriations. The organization of more than a thousand rural community units in the county home bureaus, and of district and state associations, marks an important epoch in the history of the home bureaus of New York. The membership, which is based on the calendar year in the counties, was larger in 1924 than in 1923; and figures for the first four months of 1925 indicate that the membership in 1925 will be as large as,

if not larger than, that of 1924, despite the agricultural depression. On May 1, 1925, thirteen counties had exceeded their final annual membership total as of December, 1924.

The local financial support of the home bureaus has increased during the year over that of any previous year, the grand total for 1924 being \$160,909, including county appropriations and membership dues. This does not include the budgets of the community organizations that are financed locally.

The home-bureau organization has developed increased efficiency as a result of training schools in administrative leadership, conducted in the various counties by the staff of the College. But the most significant evidence of growth is the development of the organization's power for service. This is qualitative as well as quantitative, and may be indicated by the fact that more than a fourth of the members are participating rather than receiving members. Thus, through the organized cooperation of the home bureaus, the educational service of the College to home and rural community development is extended to more homes and communities than the college staff could possibly reach.

Junior extension

Paid county-wide leadership for junior extension was employed in twenty-four counties. Of this number, two counties, Schuyler and Dutchess, employed agents for six months during the summer season, with the expectation that county supervisors would provide, in the fall, sufficient funds to continue the work for the full year. Work was conducted by county agricultural agents, home demonstration agents, teachers of agriculture, and others, in twenty-six additional counties, making a total of fifty counties having some junior extension activities carried on within their borders. Evidences of continued and increasing interest in junior extension are apparent.

Budgeted expenditures in the twenty-four counties employing agents totaled \$104,792.62. This total includes the added contribution of the State to the salary of club agents (\$600) as provided in the amendment to the law relating to county work, passed in April, 1924. County boards of supervisors appropriated \$50,675 of the above-named total, while private contributions to the county budgets comprised \$7504.62. Contributions of individuals and organizations toward prizes, trips, and so forth, are not included in the figures given. They total many thousands.

The cooperation of local banks and of the New York State Bankers' Association has been maintained as in past years. Individual banks to the number of at least sixty supported the work by direct contributions or by sponsoring clubs for growing improved crops and livestock. The Bankers' Association contributed the achievement-pin awards given to each girl or boy completing the work of a project, and, in addition, provided eight scholarships of \$250 each for junior-extension workers to attend the College or one of the state schools of agriculture. The *American Agriculturist* offered special state-wide awards. The Tioga Mill Elevator Company offered cups and medals as awards for project workers with poultry. Local business men's organizations likewise cooperated liberally in sponsoring community clubs.

Continued emphasis has been placed on local or community leadership for groups of young people in junior-extension projects. Such leadership has been markedly successful in the case of homemaking work. A total of 1455 women and men acted as such group leaders during the year. Those working with homemaking groups received special training for their work.

Girls and boys enrolled for junior extension projects totaled 15,645, an increase of 1383, or approximately 10 per cent, over the total for last year. Of this number, 13,675, or 87 per cent, were enrolled in the counties employing club agents. A much larger number were influenced in less systematic ways by the efforts of the agents, through school visits, demonstrations, literature, and other means.

Two new projects have been offered during the past year. One, in homemaking, deals with room decoration and the refinishing of furniture; the other, in farm mechanics, combines a correspondence study course with lecture demonstrations by the instructor. Enrollment in both these projects has been held to small numbers, with the idea of perfecting the material offered.

Office of Publication

The main developments in the Office of Publication during 1924-25 were concerned with improvements in the news service to the country press of the State, and with farm and home bureaus in preparing news matters for the local press and in improving their county organs, generally known as the "Farm and Home Bureau News."

As in a previous year at New Brunswick, New Jersey, so again at Raleigh, North Carolina, the College received the first award for the best exhibit of extension material in print shown at the annual meeting of the American Association of Agricultural College Editors. The College received four other blue ribbons, including those for the best extension-service organ, for the best popular bulletin, and for the best news item, issued by the various agricultural colleges.

David Seaver Cook, a recent graduate of the College of Agriculture who specialized in agricultural journalism, was appointed early in the year to take over most of the duties of Professor M. V. Atwood, whose resignation was recorded in the report of 1923-24.

News service. The news service has seen few marked changes. A new outlet for illustrated material has been found in the service of the Newspaper Enterprise Association.

The country-paper editors of the State were queried as to the type of "copy" they preferred, as between items of news and information on the one hand, and "feature" articles for farm and home on the other hand. Of the editors who expressed a preference, 42 per cent favored more straight news, 27 per cent desired the features, and 29 per cent said they wanted both. Only two editors said they did not use the news matter sent from the College. A beginning was made on a serious study to discover what New York farmers read.

During the year the press releases of the College amounted to 1603 separate items, of which 57,256 printings were seen in press clippings, representing a total circulation of 192,295,885. The largest single month each year seems to be May. In 1924 the circulation was about 26,000,000; in 1925 it was 31,026,732, or about one-sixth of the total for the year.

News-writing schools. Schools for home-bureau and farm-bureau committeemen, country correspondents, and others, where they may learn the principles of news writing as these may be applied to the reporting of organization news in local papers, have been held in most of the counties of the State. Local editors have taken part and have added much to the practical value of this instruction. At these schools, after a period of intensive instruction, news items are written by those who attend. These items are then read and discussed as to their merits, and suggestions are given for their improvement. Newspaper editors say they are getting more and better news from rural organizations, and the organizations by they are getting more consideration at the hands of the editors.

Distribution of publications. A total of 1,144,576 publications were distributed in 1924-25, as compared with 1,350,463 in 1923-24, and 1,076,635 in 1922-23. Requests for publications numbered 62,823, as compared with 62,425 similar communications in the preceding year. The practice of sending publications in response to specific requests instead of by mailing lists has proved satisfactory as the result of trial and experience.

Editing publications. With additional editorial help in the person of Miss Nellie Leonard, the editorial work is nearly current; extension publications have been printed as fast as the manuscripts have been presented, and the experiment station memoirs and bulletins, except for the delays caused by monumental monographs, are about up to date. In 1924-25 the editorial output amounted to 105 publications with 3842 pages and 1,350,700 total copies, as compared with 77 publications containing 11 all 3176 pages, and totaling 977,800 pages, in 1923-24.

Study courses. The study courses have shown consistent development under the policy by which they are restricted to those who have opportunity to actually put into practice the principles which are learned.

Decided progress was made with the correspondence courses during the year, in various directions. For example, the Federation of Wool Growers' Associations sent to its members a letter urging enrollment in the courses and suggesting that the grower or his son should register in a practical course full of up-to-date information on the subject." One set of courses in farm mechanics appealed particularly to juniors; and as a result of nineteen get-acquainted meetings, 333 Four-H Club boys were enrolled. County agricultural agents are coming to use the correspondence courses as definite parts of their extension programs, and are recommending the study courses to members of the farm bureau.

Two courses, aimed to develop "leadership," were unqualified failures. One, in farm bureau leadership, after twenty months had only seventeen enrollments, only one report submitted, and no completions; the other, in recreational leadership, never had an enrollment. The response to these courses was enlightening, and seems to indicate, either that real workers are too busy to worry about "leadership," or that most persons are modestly unwilling to designate themselves as "leaders" or as candidates for "leadership."

The following tables give records of the courses. The first is a five-years cumulative report beginning with July 1, 1920, the time when the correspondence courses as now conducted were started. The second is the report for the past fiscal year.

**SUMMARY OF CORNELL STUDY COURSES FOR FIVE YEARS, FROM JULY 1, 1920,
TO JUNE 30, 1925**

Subject	Num- ber of months given	Enrollment			Reports		Completions	
		Total	Active June 30, 1925	Net*	Num- ber	Average to enroll- ment	Num- ber	Per cent of re- enroll- ment
Beekeeping.....	25	56	18	38	405	7.2	10	2.5
Farm management.....	51	269	73	196	3,234	12.0	32	1.2
Milk production.....	41	160	44	116	1,224	7.7	23	1.9
Orchard fruits.....	29	82	36	46	698	8.5	7	1.3
Pork production.....	21	16	5	11	128	8.0	4	3.1
Poultry.....	52	844	200	644	6,307	7.5	39	0.6
Sheep and wool.....	26	89	44	45	616	6.9	11	24.4
Small fruits.....	40	66	11	55	571	8.7	3	5.1
Vegetable forcing.....	26	26	3	23	175	6.7	3	15.6
Vegetable gardening.....	39	102	29	73	696	6.8	9	12.1
Farm mechanics (junior) ..	9	382	109	273	1,275	3.3	79	24.4
Farm mechanics.....	9	31	25	6	113	3.6	1	10.1
Farm bureau.....	20	17	.....	17	1	.....	.....	.....
Total.....	.....	2,140	597	1,543	15,443	7.2	221	14.1

* The figures in this column show the number of students who have completed the respective course or have been dropped.

SUMMARY OF CORNELL STUDY COURSES FOR 1924-25

Subject	Reports		Enrollments				Num- ber of com- ple- tions	Num- ber of reports	Practices changed or adopted	
	Num- ber re- ceived	Aver- age num- ber per month	Num- ber on July 1, 1924	New	Total	Num- ber on June 30, 1925			Num- ber	Aver- age number per report
Farm management..	1,053	87.8	91	65	156	73	16	15	77	5.5
Milk production....	482	40.2	39	44	83	44	12	12	66	5.5
Orchard fruits.....	367	30.6	32	33	65	36	1	3	11	3.3
Pork production....	103	8.6	7	8	15	5	4	3	16	5.3
Poultry.....	2,148	179.0	221	211	432	200	17	9	51	5.7
Sheep and wool.....	419	34.9	30	54	84	44	11	14	94	5.7
Small fruits.....	210	17.5	16	14	30	11	1	1	3	3.0
Vegetable forcing...	74	6.0	10	3	13	3	2	1	5	5.0
Vegetable gardening.	287	23.9	21	33	54	29	2	.....	.....	.....
Farm mechanics (junior).....	1,275	106.3	.....	382	382	109	79	4	17	4.1
Farm mechanics....	113	9.4	.....	31	31	25	1	.....	.....	.....
Beekeeping.....	158	13.2	21	22	43	18	8	5	27	5.4
Total.....	6,689	557.4	488	900	1,388	597	154	67	367	5.5

Publications issued. The following tabular list classifies the publications issued during the year by kinds and titles, and shows the number of printed pages and the number of copies issued for each one, together with a summary of the total.

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
76 Effect of the process of manufacture on the germ content of bulk condensed milk (Dairy Industry).....	18	3,500
77 A systematic study of the Anthomyiinae of New York, with especial reference to the male and female genitalia (Entomology)	91	3,200
78 A study of the leaf-mining Diptera of North America (Entomology)	228	3,500
79 A biological study of <i>Aphelinus mali</i> Hald., a parasite of the woolly apple aphid, <i>Eriosoma lanigera</i> Hausm. (Entomology).....	27	3,500
80 The Cicadellidae of the vicinity of Ithaca, New York, with special reference to the structure of the gonapophyses (Entomology)	115	3,200
81 Some effects of freezing on mature fruits of the apple (Pomology)	54	5,000
82 Inheritance of xantha seedlings in maize (Plant Breeding)..	13	3,500
83 The inheritance of brown aleurone in maize (Plant Breeding)	22	3,500
84 Genetic relations of five factor pairs for virescent seedlings in maize (Plant Breeding).....	38	3,500
85 Wire stem of cabbage (Plant Pathology).....	60	3,000
86 A study of the dietary relationships and the pathology of "stiffness" in swine (Animal Husbandry).....	34	3,500
87 Studies in the transplanting of vegetable plants (Vegetable Gardening)	63	3,500
88 The take-all disease of cereals and grasses caused by <i>Ophiobolus cariceti</i> (Berkeley and Broome) Saccardo (Plant Pathology)	45	3,500
89 The gray bulb-rot of tulips caused by <i>Rhizoctonia tuliparum</i> (Kleb.) n. comb. (Plant Pathology).....	18	3,500
90 The production of volatile fatty acids in the intestinal tract of calves fed whole milk or cereal gruel (Animal Husbandry)	32	3,500
91 The relation of soil moisture and nitrates to the effects of sod on plum and cherry trees (Agronomy Pomology)...	21	3,500
Total	879	56,400
EXPERIMENT STATION BULLETINS:		
403 (Reprint) Raising colts (Animal Husbandry).....	49	5,000
430 An economic study of rural store credit in New York (Agricultural Economics and Farm Management).....	39	10,000
431 The cost of living in a small factory town (Agricultural Economics and Farm Management).....	60	6,000
432 An economic study of dairying on 163 farms in Herkimer County, New York (Agricultural Economics and Farm Management)	59	6,000
433 Economic studies of dairy farming in New York. II. Grade A milk with and without cash crops (Agricultural Economics and Farm Management).....	139	10,000
434 Experiments in crop rotation and fertilization (Plant Breeding)	56	6,000
435 The organization and development of cooperative fire insurance companies in New York (Agricultural Economics and Farm Management).....	36	10,000
436 Results of experiments with oats in New York (Plant Breeding)	24	7,500
437 Feeding work horses (Animal Husbandry).....	59	8,000
438 Economic studies of dairy farming in New York. III. Grade B milk with alfalfa roughage (Agricultural Economics and Farm Management).....	104	6,000

439 Rearing calves by the use of calf-meal gruel (Animal Husbandry)	23	10,000
440 An economic study of the marketing of New York potatoes (Agricultural Economics and Farm Management).....	172	8,000
Total	820	92,500

READING-COURSE LESSONS FOR THE FARM:

115 (Reprint) Keeping sheep for profit (Animal Husbandry) ..	22	5,000
121 (Reprint) The culture of garden roses (Floriculture and Ornamental Horticulture)	24	8,000
134 (Reprint) Starting a flock of sheep (Animal Husbandry) ..	14	3,000
156 (Reprint) Incubation (Poultry Husbandry).....	38	10,000
157 (Reprint) Feeding for egg production (Poultry Husbandry)	44	10,000
159 (Reprint) Forest planting on the farm (Forestry).....	38	10,000
163 (Revised reprint) Making butter on the farm (Dairy Industry)	16	3,000
Total	196	49,000

READING-COURSE LESSONS FOR THE HOME:

87 (Reprint) The decorative use of flowers (Home Economics)	24	5,000
108 (Reprint) Planning the home kitchen (Home Economics) ..	19	5,000
136 (Reprint) Food preservation (Home Economics).....	86	15,000
Total	129	25,000

EXTENSION BULLETINS:

21 (Reprint) How to select laying hens (Poultry Husbandry) ..	13	10,000
45 (Revised reprint) Cornell poultry rations (Poultry Husbandry)	11	25,000
47 (Reprint) List of popular publications (Extension Service) ..	4	146,000
56 (Revised reprint) Strawberry culture in New York State (Pomology)	18	7,000
57 (Revised reprint) Soldering (Rural Engineering).....	27	5,000
71 (Revised reprint) Food-value chart (Home Economics)...	4	25,000
73 (Reprint) Rearing calves and heifers (Animal Husbandry)	20	6,000
86 (Revised reprint) The apple and thorn skeletonizer and its control (Entomology)	7	5,000
88 How to use apples as food (Home Economics).....	18	15,000
89 The home orchard and fruit garden (Pomology).....	52	10,000
90 Artificial illumination of poultry houses for winter egg production (Rural Engineering).....	28	10,000
91 The gummed-paper dress form. Part I. How to make the dress form (Home Economics).....	15	5,000
92 The gummed-paper dress form. Part II. Altering the dress form (Home Economics).....	10	5,000
93 The gummed-paper dress form. Part III. Covering and mounting the dress form (Home Economics).....	7	5,000
94 Fitting the farm saws (Rural Engineering).....	36	7,000
95 Growing peas for the canning factory (Vegetable Gardening)	24	6,000
96 Growing tomatoes for the canning factory (Vegetable Gardening)	26	5,000
97 Growing sweet corn for the canning factory (Vegetable Gardening)	17	6,000
98 The production and marketing of field beans (Vegetable Gardening)	29	5,000
99 The editorial page in the country weekly (Extension Service)	21	5,000

REPORT OF THE DIRECTORS

53

100 Reading copy on the country weekly (Extension Service) .	18	5,000
101 Local features in the country weekly (Extension Service) .	18	5,000
102 Electric washing machines (Home Economics)	11	5,000
103 Portable electric vacuum cleaners (Home Economics)	8	5,000
104 The effectiveness of extension in reaching rural people (Extension Service)	31	8,000
105 Milk as a daily food (Home Economics)	35	10,000
106 Remodeling a straw hat (Home Economics)	17	10,000
107 Unripened soft cheese (Dairy Industry)	15	5,000
108 The farm shop and tool equipment (Rural Engineering) . .	27	10,000
109 Making ice cream, sherbets, and ices for home use (Dairy Industry)	7	15,000
110 Play equipment for the home and for the rural school (Rural Social Organization)	19	10,000
111 Dairy-barn rearrangement (Agricultural Economics and Farm Management)	9	8,000
112 Bearded iris: a perennial suited to all gardens (Flori- culture and Ornamental Horticulture)	92	10,000
113 Ten years of management of the Cornell University wood- lots (Forestry)	27	7,500
114 The care of the mature apple orchard (Pomology)	31	10,000
115 Chicken lice and mites and their control (Entomology) . . .	17	15,000
116 Methods of testing and of determining relative values of milk (Dairy Industry)	35	8,000
117 A system of pedigree hatching and record keeping for poultry (Poultry Husbandry)	29	5,000
118 Reducing the feed cost of milk production (Animal Hus- bandry)	18	7,500
119 Health and personal appearance (Home Economics)	23	5,000
120 How to make cottage cheese and other soft cheeses in the home (Dairy Industry)	5	8,000
121 Soil and crop management for Tompkins County, New York (Agronomy)	66	10,000
122 Better seed for commercial vegetable growers (Vegetable Gardening)	22	5,000
123 A pageant of agriculture (Rural Social Organization)	23	5,000
124 Dairy improvement associations (Animal Husbandry)	26	3,500
125 Hill-unit selection of potatoes (Plant Breeding)	11	5,000
126 Harvesting, grading, packing, and loading apples, with some attention to peaches and pears (Pomology)	45	10,000
Total	<u>1,072</u>	<u>523,500</u>

JUNIOR EXTENSION BULLETINS:

1 (Partial reprint) Clothing project record sheet (Home Economics)	4	20,000
6 (Revised reprint) Potato growing for boys and girls (Vege- table Gardening)	23	10,000
11 (Reprint) Vegetable gardening for boys and girls (Vege- table Gardening)	39	15,000
12 Poultry keeping for junior poultrymen (Poultry Hus- bandry)	45	15,000
13 Tying knots and splicing rope (Rural Engineering)	24	5,000
Total	<u>135</u>	<u>65,000</u>

RURAL SCHOOL LEAFLETS:

September, 1924 (Rural Education)	140	20,000
November, 1924 (Rural Education)	36	150,000
January, 1925 (Rural Education)	40	150,000
March, 1925 (Rural Education)	48	150,000
Total	<u>264</u>	<u>470,000</u>

MISCELLANEOUS:

Program of the Extension Service annual conference (Extension Service)	8	500
Agricultural business and marketing: announcement of courses offered at the New York State College of Agriculture (Agricultural Economics and Farm Management).....	8	3,000
Community meetings: how the College of Agriculture can help (Extension Service)	13	8,000
Program of the eighteenth annual Farmers' Week, 1925.....	32	12,000
(Reprint) How to keep an account with a crop (Agricultural Economics and Farm Management).....	15	5,000
(Reprint) How to keep a cash account on a farm (Agricultural Economics and Farm Management).....	36	5,000
How to keep a poultry account (Agricultural Economics and Farm Management)	24	5,000
Short course in advanced beekeeping (Entomology).....	8	2,000
Total	144	40,500
ANNUAL REPORT FOR 1924.....	89	3,800
ANNOUNCEMENTS:		
Announcement of courses, 1924-25.....	80	15,000
Announcement of winter courses, 1924-25.....	34	10,000
Total	114	25,000

SUMMARY

	Total number*	Total pages	Copies
Memoirs	16	879	56,400
Experiment station bulletins.....	12	820	92,500
Reading-course lessons for the farm.....	7	196	49,000
Reading-course lessons for the home.....	3	129	25,000
Extension bulletins	47	1,072	523,500
Junior extension bulletins.....	5	135	65,000
Rural school leaflets.....	4	264	470,000
Miscellaneous	8	144	40,500
Annual report	1	89	3,800
Announcements	2	114	25,000
Total	105	3,842	1,350,700

* Including reprints.

The foregoing list does not include the twelve monthly issues of the *Extension Service News*, an eight-page organ of the Extension Service, nor the twelve monthly issues of the *Service Sheet*, a two-page publication for rural newspapers.

Agricultural Economics and Farm Management

During the year 1924-25, members of the Department of Agricultural Economics and Farm Management conducted alone or in cooperation with other departments six extension schools having a total cumulative attendance of 537, and gave 256 lectures with a total attendance of 11,400. The lectures were given at farm-bureau community meetings, extension schools, farmers' institutes, rotary clubs, business men's clubs, and grant meetings. The principal subjects discussed at these meetings were: price

of farm products; adjusting farming to meet the present and the probable future price conditions; some principles of successful cooperation; how to study the financial statements of cooperative associations; some problems of milk marketing; marketing New York State products; how to take a farm inventory and make a credit statement; why some farms pay better than others; farm credit. Of these subjects, the greatest interest was shown by farmers in the first and the second.

Members of this department also held 43 conferences with officers or committeemen of local farm bureaus, agricultural teachers, and officers and members of marketing associations and other agricultural organizations.

The farm-management correspondence course has maintained an average enrollment of about 85 during the year. At present the enrollment is 79. A course in agricultural prices has been prepared and will be offered this fall.

The special farm-management service organized in Genesee County in 1921 was continued in that county during 1924. This work was extended to thirty-four farms in Chautauqua, Monroe, Oswego, and Genesee Counties. Extension specialists from the department make a labor-income survey of the farm business, prepare a map of the farm showing field lines and acreages and furnish the farmer with blueprint copies, make a farm-management study and analysis of the farm business, and try to find ways of increasing the profitableness of the farm. At the end of the year the extension specialist has a conference with the farmer, takes another labor-income record, discusses recommendations for possible changes in farm organization, layout, and building arrangement, and gives whatever assistance is desired in summarizing or starting farm accounts. Because of the labor and expense involved, the service has usually been placed in counties where considerable other farm-management work is being done, and the farmers included in it are generally farm-management project leaders for their communities.

During the year, fourteen farm-management tours and two dairy-barn tours were conducted. Tours offer an excellent opportunity for doing extension work with a group of farmers at a season of the year when it is not practicable to hold community meetings.

One of the most important pieces of extension work done by the department during the past year has been contributed by members of the resident staff in a monthly publication, entitled *Farm Economics*. This publication, which gives a monthly review of agricultural prices and conditions, is now being sent to farm-bureau committeemen, agricultural teachers, country bankers, county agricultural agents, grange officials, farm-management project leaders, and other leading agriculturists in the State. It is now being sent to approximately 1775 persons. It is intended to be the basis of news articles and is widely used for this purpose.

In addition to the marketing work conducted at extension schools, already referred to, much assistance has been rendered by members of the department to officers of a number of cooperative marketing associations. This work, which was always done at the request of the associations, consisted in helping them to plan and establish sound financial marketing policies.

Agronomy

A strict-economy crop-production program has been continued throughout the past year by the Department of Agronomy. Emphasis has again been placed on methods of soil management and of crop production which would lower unit-production costs even though they might be inadequate for maximum yields. Farmers have been advised to make more adequate use of the farm supply of both plant food and animal feed, and thereby reduce the need for purchased fertilizers and concentrates.

The production of an increased acreage of legumes has been advocated. The drive for more legumes has been under way for several years, and effective work is being done in cooperation with the Department of Agricultural Economics and Farm Management and the Department of Animal Husbandry, both of this College. Alfalfa and sweet clover have been recommended for the limestone soils of the State, the former for hay and the latter as a rotation pasture crop. Red and alsike clover have been advocated throughout the State. Due to the scarcity and the high price of red-clover seed, farmers have been advised to use more alsike and less red clover in their seeding mixtures. On acid soils alsike should be the only clover seeded.

An alfalfa campaign has been conducted in four counties—Livingston, Monroe, Orleans, and Seneca. This work was started with a preliminary field survey in the fall of 1924. From fifty to one hundred farms were visited in each of the four counties, and records relative to alfalfa production were taken. Sixty-four alfalfa meetings were held in the four counties last winter. As a result of these meetings, four hundred farmers asked for personal assistance in starting alfalfa. These men were all visited on their individual farms by the county agent and the specialist, and detailed specifications were furnished for alfalfa production. In connection with this work, approximately 500 soil samples were taken in the field and examined in the laboratory. This work will be continued and expanded so far as funds will permit.

The use of lime for alfalfa and clover has been advocated. Clover failure is due more often to acid soils than to any other single factor. By inducing farmers to increase their acreage of alfalfa, red clover, and sweet clover, the use of lime is correspondingly increased because on most soils these crops require liming. Economic field-crop production is dependent to a large degree on the development of an adequate liming practice in the State.

Better conservation of the farm-manure supply has been recommended. Farmers have been urged to apply manure at light rates in order to cover the maximum acreage. Acid phosphate has been recommended, along with legumes and manure, for the grain crops. Where complete fertilizers are needed, home-mixing has been advocated, and in case of mixed goods being used those of high analysis, preferably containing from 18 to 20 per cent of plant-food, have been recommended.

Legume production, lime and fertilizer practices, utilization of farm manure, and pasture management, have been emphasized at the winter meetings. Extension specialists of the department conducted 151 meetings with a total attendance of 4700, while the seasonal workers spoke to 4315 persons at 184 meetings.

The field work has consisted of conferences with county agents, personal farm visits, and inspection of field demonstrations. Specialists have spent 405 days in the field, and have made more than a thousand farm visits. The agronomy field demonstrations conducted during the summer of 1924 number approximately 300 and have been scattered throughout most of the counties of the State.

The office work has consisted largely of correspondence with farmers and county agents of the State. A total of 3700 personal and 10 circular letters have been written. Soil samples to the number of 1050 have been examined.

A new leaflet dealing with the use of acid phosphate has been prepared. Three leaflets have been revised and a new supply printed, concerning the following subjects: liming New York soils; New York's "High Five" fertilizers; the home mixing of fertilizers. Forty-eight articles and 125 notes dealing with soils and crops have been prepared for the regular Farm Bureau News Service of the State. Ten articles have been written for the farm press.

Animal Husbandry

While six extension specialists are regularly employed in the Department of Animal Husbandry, only five were in service until September 1, 1924. No changes in the division of work as reported last year have been made, except that in place of a dairy-production specialist a livestock-club specialist has been added. The list is as follows: dairy production, two specialists; dairy-improvement associations and dairy clubs, one specialist; sheep and wool production, one specialist; livestock sanitation, one specialist; club work, one specialist.

The principal emphasis of the 1924 program has been on the following points:

1. The use of legumes in reducing the cost of feeding. The culture of legumes has been widely urged, on the ground that, if available, they will be used and thus automatically accomplish their purpose. Demonstrations and lectures in many counties have aroused keen interest in the subject.

2. Standards for profitable production in animals. With dairy cattle, this has taken the form of "fewer and better cows." Dairy-improvement associations and clubs have been active. Shepherds have been urged to cull their flocks closely. The importance of securing and using sires of merit has been consistently urged. Nearly every teaching and demonstration agency has been employed to this end.

3. The necessity of sound animals, as a part of a balanced program for economical production. Methods that will check or control disease, insure regular breeding, and produce sound, vigorous young stock, have been persistently taught. That this is one of the keys to success is becoming better appreciated. The futility of continuing to use animals of reduced physical vigor, from whatever cause, seems so apparent that this feature can hardly be overemphasized.

Recently the ration service has been divided into two parts. An extension feed service, covering prices and suggested mixtures, goes out each month for general use in the counties. This is usually published in the *Farm Bureau News*. In addition to this, a personal feed-service letter

is now prepared and sent to most counties. This is transmitted by the county agent to a special list of dairymen in the county who have requested the service. In this personal letter, the trend of prices is noted and suitable mixtures are suggested. Also, some timely or seasonal matter is brought to the attention of the dairymen. The monthly personal feed-service letter went to 9668 farmers during the year.

The interest in the farm-study courses continues to grow. The persons who have finished these courses since November 1, 1924, have definitely reported a total of 160 actual separate practices changed or adopted as a result of taking the courses. This includes only those reported voluntarily, in writing, by students who have finished the courses within this period. The practices are divided as follows: 16 in pork production, 66 in milk production, and 94 in sheep and wool. While these replies are not a true measure of the effectiveness of the work, they are significant. Many interesting letters from students describing how they have applied the lessons are on file.

Two extension bulletins and twenty-four short articles for the county farm-bureau publications have been written during the year. The latter have appeared, in all, 297 times in the *Farm Bureau News* of various counties. There has been a wide circulation of short news items on animal husbandry, published in the daily and the weekly press. While some of these come from other sources, many of them are prepared by animal-husbandry specialists or are abstracted from articles written by them. During the nine months covered by their reports there was a circulation of more than two million of such stories. In addition to the bulletins and articles, 49 circular letters have been sent to 2893 persons, and 8217 other letters have been written.

The number of full-sized active dairy-improvement associations is twenty-five. More could readily be formed if the farmers who are interested were not so widely scattered. To serve the smaller groups, dairy-improvement clubs are often formed; Ulster and Oswego Counties have been the most successful with such clubs. During the past year a greater effort has been made to get the books of the regular association summarized and the facts gathered and returned more promptly to the members. To make available as many testers as possible, the practice is followed of holding schools for prospective testers at frequent intervals, at the College.

The sheep business in the State is in a very flourishing condition. While there is no boom in this industry, there is considerable activity among breeders and wool growers, as well as in the junior lamb-club work. The state wool pool still functions, and breeders have made consignments to the pool more generally than in years past.

The testing of dairy herds for tuberculosis is the largest single livestock project under way in the State. However, in the nature of the case, the specialists' relations to the work are remote. It has been possible to explain the work to groups with a view to affording them necessary information for the protection of their herds and their markets for milk. Where testing is under way, the need to clean up the premises properly has been stressed. The report on this project shows that 6741 barns have been disinfected and whitewashed, and the watering practices have been made

more sanitary in 585. The effort to interest herd owners in herd health records initiated a year ago has received some response. Forty-seven herd owners are now keeping records on forms supplied by this office. A few records have been kept long enough to convince the owners of the value of such information. Local veterinarians have given cooperation in this project.

The employment of a specialist in livestock-club work during the current year has demonstrated that this project has large possibilities. Thus far, preliminary groundwork only has been done. The number of calf and lamb clubs shows an increase over last year, but totals are not available because many quotas are not yet filled. Special meetings are held to organize clubs and give definite instruction to members. To further the work, a manual for calf-club workers has been written. Numerous special lessons in mimeographed form are sent out to clubs to supplement other material.

The work of the specialists is distributed between the different activities in about the usual proportion. There has been an increase in demonstrations over last year, but a falling-off in lectures. Conferences and personal service work have increased. Fewer days were spent in the field than a year ago, but the total number of contacts is about six hundred larger than that of last year.

Results. Since changes in practice are a measure of the spread of extension work, the following data gleaned from the animal reports of the county agricultural agents are submitted for consideration. While some of the factors are obviously difficult to measure accurately, the project as a whole has progressed in the desired direction.

Farmers feeding legume hay for the first time.....	1,012
Farmers reporting gain in milk per cow by feeding legume hay.....	473
Was milk produced at greater or less feed cost by legumes?.....	Less
Was grain saved as compared with previous years by using legumes?.....	Yes
Farmers receiving monthly personal feed-service letter.....	9,668
Farmers reporting increased use of silage.....	67
Farmers reporting gain in milk production from silage.....	430
Bulls owned by two or three partners purchased during year.....	108
Townships covered by livestock survey.....	56
Male stock enumerated in surveys.....	461
Grade or scrub males enumerated in surveys.....	542
Purebred bulls enumerated in surveys.....	540
Grade or scrub bulls enumerated—same area.....	860
Tried or proved bulls recognized during year.....	10
Farms adopting regular exercise for bulls.....	56
Inferior bulls in test associations replaced.....	50
Test members purchasing purebred cows.....	166
Number of purebred cows purchased by members.....	520
Dairy-improvement clubs active.....	22
Members of dairy-improvement clubs.....	332
Milk-weight sheets distributed to farmers.....	6,400
Flock-demonstration records kept.....	11
Two flocks culled before breeding.....	24
Ewes discarded	307
Rams discarded	33
Rams selected to head flocks.....	44
Lambs docked	772
Lambs castrated	397
Sheep treated for stomach worms.....	1,053
Farmers using succulent feed in winter ration for sheep.....	537

Barns where light and ventilation have been improved.....	976
Stables where a more sanitary watering practice has been adopted.....	585
Barns thoroughly disinfected and whitewashed.....	6,741
Farms where pasteurizing skimmilk for calves has been adopted.....	366
Farms where young stock have been separated from mature stock.....	86
Farms where systematic health records are kept.....	47
Method demonstrations given.....	342
Adult result demonstrations started.....	307
Adult result demonstrations completed or carried.....	304
Animals involved in completed demonstrations.....	17,293
• Profit or savings on demonstrations.....	\$14,725
Farms assisted in obtaining purebred sires.....	353
Farms assisted in obtaining purebred or high-grade females.....	686
Farms culling herds or flocks for the first time.....	1,621
Animals in such herds or flocks.....	6,271
Animals discarded	1,706
Breed associations or clubs organized.....	15
Members in such associations.....	305
Cow-test associations organized or reorganized.....	31
Members in such associations.....	1,065
Farms not in associations testing cows.....	6,955
Farms feeding better-balanced rations for the first time.....	1,865
Farmers controlling insect pests for the first time.....	85
Farmers influenced to test for tuberculosis.....	17,882
Farmers adopting improved practices in livestock.....	21,970

Botany

About 17,500 inoculation cultures for leguminous crops have been sent out by the Department of Botany during the past year. A nominal charge to cover the cost of the materials is made for these cultures.

Dairy Industry

The Department of Dairy Industry has made important contributions in the improvement of city milk supplies, by working cooperatively with local health boards and municipal authorities for improved methods of handling and inspection and for more rational ordinances. This project is being continued in the cities of Canandaigua, Hudson, and Albany. The problem presents many angles and many difficulties, but it is felt that real progress is being made, and as soon as a few cities have made the improvement looked for, others will follow more rapidly.

Important work has been done also with the dairy manufacturing interests of the State, toward improved methods. Most of the service to dairy plants is individual in nature, consisting in giving personal instruction to one or more employees at a given plant. The following is a list of the problems concerning which manufacturers have requested assistance from this department: gassy cheese; off flavors in cheese and butter; high acidity in cheese and cream; fat losses in butter making; keeping quality of butter; starter making; methods of making various types of cheese; the making of fermented-milk drinks; control of overrun; factory plans; factory equipment; factory organization; cost records; destruction of the cream line in pasteurized milk; ropy milk; excessive bacterial contamination; bacteriological laboratory technique at milk plants; losses in condensed milk; composition of mix in ice cream; use of improvers in ice cream; body and texture of ice cream; refrigeration; transportation and distribution; manufacturing records.

Entomology

Control of insect pests. The most important phase of the work of the Department of Entomology in the control of insect pests is conducted in cooperation with the Department of Plant Pathology, and consists in maintaining a spray-information service conducted through the farm bureaus in those counties where fruit and vegetable-growing are important industries. The success of this work in previous years has led to a considerable increase in the number of counties to which this service is given. In the following counties a special field assistant was employed during the growing season to conduct the work locally: Dutchess, G. E. R. Hervey; Erie, M. N. Taylor; Genesee and Wyoming, D. L. Hayes; Greene, A. S. Mills; Monroe, R. C. Combs; Nassau, L. E. Fitch; Ontario, A. B. Burrell; Orange, A. D. Long; Ulster, C. C. Wagoner; Wayne and Oswego, W. D. Mills. In the following counties the county agent himself acted as special field assistant: Columbia, A. B. Bucholz; Onondaga, D. D. Ward; Orleans, J. G. Palmer. In the following counties a spray-information service is conducted by the county agent without his being formally appointed as special field agent: Rockland, Westchester, Rensselaer, Albany, Clinton, Essex, Suffolk, Yates, Seneca, Chautauqua. Much time and effort are spent by the extension entomologist in training and supervising the special field assistants and in assisting county agents in conducting the spray-information service in a practical and efficient way. An attempt is made to keep in close touch with the insect situation in each county, to see that the proper information is issued to the farmers at the time when they can use it to the best advantage, and to anticipate, as far as possible, the needs of the farmers in each locality. Close touch with the situation and with the needs of those conducting the service locally is maintained by correspondence, by telephone, and by frequent visits.

In addition to the spray-information service, an extensive correspondence with individual growers is required. Hundreds of specimens are received by the department, with requests for identification and advice on control measures. Oral instruction is given in extension schools, at farmers' meetings, and on fruit and potato tours.

Apiculture. The activities of the extension specialist in apiculture for the period covered by this report have been continued along much the same lines as in previous years. An interesting development has been the falling-off of the insistent demand on the part of beekeepers for assistance in marketing, and a corresponding increase in the number of inquiries concerning problems of production.

As much time as was possible, however, was given to assisting the Empire State Honey Marketing Cooperative Association, Inc., in its problems. This organization has now completed its second year of activity, and has had an opportunity to demonstrate a unique scheme of selling. It has a three-years contract with a sales organization which carries on all of the business activities at the expense of the association, in this way relieving the association of the overhead expense and of an otherwise necessary initial heavy indebtedness. The specialist's activities with this organization were confined to the discussion and adoption of official grades and standards for honey, and to explaining at meetings of beekeepers the activities of the organization and its limitations.

Subject matter in beekeeping has been presented by lecture and demonstration. The demonstration form of teaching was employed in September and October, when the specialist visited eighteen counties with an automobile equipped to give a complete demonstration in the method of disinfecting honeycombs that have been in hives infected with American foul-brood. This is a new process, and the interest shown at the meetings was thoroughly gratifying. The State Department of Farms and Markets, which is in charge of apiary inspection work in New York, cooperated in this project. On an average, 21 beekeepers attended the demonstrations in each county.

Most of the work done in the field was by lectures at meetings of beekeepers' organizations. Five radio talks from four stations in the State were given. Four of these were chiefly about honey and its value as a food. The effect on the honey market in New York was immediate.

Forty-three students have been enrolled in the farm study course in beekeeping. A striking result of what this course may do was shown at the summer meeting of the Finger Lakes Honey Producers' Association, where the specialist conducted a contest in general beekeeping. Ten questions were asked, and the answers were written on papers with numbers to identify the owners but with no names given. The only perfect paper handed in was by one of the study-course students, and the second highest was by the only other student of that course in the group. The comments of the beekeepers who have completed the course to date are highly gratifying.

Monthly contact is maintained with the members of twenty beekeepers associations in the State by means of a two-page mimeographed sheet called *Beekeeping News of New York State*. Copies of this sheet are sent to the secretaries of the associations for one cent a copy. In addition to timely suggestions and announcements, the sheet reports the honey market in six cities in the State.

During the Christmas holidays the specialist made a study of the honey market in the city of New York. From this study it was learned that the recent failures of the California sage-honey crop account for the concurrent prosperity of the New York clover-honey producers. It was discovered also that the activities of our local marketing association, with its tendency to corner the supply of buckwheat honey, has forced the competing sales agencies to adopt a blend of a small quantity of buckwheat honey with a large quantity of inferior, cheap, West Indian and South American honey. Since the New York City consumer does not call for buckwheat honey as such, but knows merely that he wants a strong dark honey the flavor of which is familiar to him, it is not difficult to sell large quantities of this substitute.

A one-week course in advanced beekeeping was given at the College during the last week in January. Eighty-four beekeepers attended, despite the severest winter weather of many years. The instruction staff for the occasion formed the most distinguished group of beekeeping authorities ever assembled in this country for the purpose.

The cellaring service, originated in 1922 by special arrangement with the Office of the United States Weather Bureau for the purpose of advising beekeepers when to put bees in the cellar in the fall and when to take

them out in the spring, was continued this year with a large increase in requests for the service. The notification is given by wiring the local county agent or an officer of the local beekeepers' association, who relays the message to the beekeeper by telephone. Twenty-six counties get this service. Efficiency in speeding up the sending of this information was obtained this year by enlisting the cooperation of broadcasting stations WGY and WEAJ, whence this service was radiocast within two hours of the time it had been determined at the College.

Statistically, the specialist gave 50 lectures with an attendance of 1993, radio talks, and 21 method demonstrations with an attendance of 353; he also visited 45 apiaries, held 45 conferences with 116 persons, and spent 99 days in the field. Eleven articles of 32 typewritten pages were prepared for the press. There were 28 circular letters written, with a circulation of 7126; and in regular correspondence 801 letters were written.

Birds and mammals. In cooperation with the United States Biological Survey, a campaign for the control of woodchucks was conducted during the spring of 1925. These usually harmless animals have become very numerous in some sections of the State, and were destroying crops in rather large proportions. The purpose of the demonstrations given was to instruct in the most approved methods of control, and at the same time warn against excessive measures.

Some tentative steps were taken also looking toward rat campaigns. Two counties near New York were given some help in organizing trial campaigns on a small scale, and, if the results seem to warrant it, the work may be enlarged later.

About the usual numbers of bird lectures were given to schools, ranges, sportsmen's clubs, and other organizations. The junior club organizations are becoming increasingly interested in this subject.

Floriculture and Ornamental Horticulture

The extension program of the Department of Floriculture and Ornamental Horticulture during the past year has consisted chiefly in demonstrational field work, and has included county-wide improvement campaigns in four counties. Such a program has naturally produced considerable interest, with the result that there has appeared a steadily increasing call for further information in the form of leaflets, circulars, and bulletins. At the present time no such information is available from any source.

The chief problem of 1924-25 appeared to be that of reaching the maximum number of individuals with a method of teaching which would make it possible for them to independently improve the conditions of their home yards, their school yards, and the many varied properties in which the farmer may have an interest. With this problem comes that of developing a wholesome sense of home and community pride through the possession of attractive, lovable homes, good school properties, and fine communities. The lectures and demonstrations offered are the means employed to meet this problem.

Subject matter is taught by means of lectures illustrated by slides, materials, and chalk sketches; through demonstrations conducted in the

field in connection with some public property; by exhibits placed at the State Fair and at county fairs; and through publications, circulars, news articles, and correspondence.

Forestry

The marked features in the extension work of the Department of Forestry during the past year have been the further development of cooperation with the county agents; the encouragement of forestry work by hunting and fishing clubs and by schools (especially in tree planting) and aid rendered to the boy-scout organizations.

The extension work in forestry has centered around three subjects: (1) the reforestation of idle lands; (2) the care of growing woodlands; and (3) the harvesting of the mature crop. Emphasis on these three phases of New York's farm-forestry problems was given by exhibit material and lectures during Farmers' Week, was further brought to the attention of county agents in the regional conferences, and was finally sent out in project form to the county agents.

Under the forest-planting subproject, which is the one that has received the bulk of attention from the extension workers in the department for the past few years, the outstanding features for the year are:

1. Cooperation with the Extension Department of the State of Pennsylvania, the United States Forest Service, and the Erie Railroad in sending a lecture and exhibit train through the southern-tier counties of New York, in which reforestation was the main subject emphasized.

2. Preparation and distribution to the county agents of a demonstration-plantation record-card, so that the twelve hundred demonstrations now established may be followed step by step in their growth.

3. Assisting new county agents in the demonstration planting work during the spring of 1925, and perfecting plans for the continuation of free trees for demonstration plantations for one more year.

4. By articles, lectures, and actual field assistance, furthering the reforestation activities of county forestry committees, sportsmen's clubs, boy-scout organizations, school districts, and private individuals.

5. Arranging a three-days farm-bureau forestry tour through the Adirondacks under the leadership of C. R. Pettis, of the New York State Conservation Commission, in which all ages and species of plantations were carefully inspected. More than sixty men attended this tour, including fifteen county agents and many reforestation committees of the farm bureaus and county boards of supervisors.

Under the second subproject, no definite woodland-improvement demonstrations were held during the year. A large number of such demonstrations previously established were visited, however, in order to become familiar with the details and lay plans for future inspection tours and follow-up work in these growing woodlots.

The third subproject, that in harvesting the mature crop, was conducted by means of the Federal Land Bank cruising stick, which enables the farmer to estimate easily and accurately the quantity of his standing timber. At Farmers' Week a dozen sets of these sticks were sold. Since then, demonstrations of the use of the stick have been held in Oswego, Chautauqua, Schuyler, and Broome Counties, with encouraging results.

An additional matter which comes under the supervision of this department is cooperation with the white-pine blister-rust agents within the State. These men are under the administrative supervision of the State Conservation Commission, but Cornell is responsible for their forestry subject-matter. This responsibility has been discharged by meeting the groups in conference early in the fall, and following these meetings with personal conferences with each of the men in the field.

Home Economics

In the College of Home Economics during the past year, the home demonstration agents have taken more of the responsibility for teaching, and have shown more initiative in adapting their teaching to local conditions, than has been the case during the three or four preceding years. In the early development of the local-leadership method of extension teaching, there arose a tendency for the agent to be considered as the organizer, and the specialist as the teacher. This was found to have certain disadvantages; the agents were not sufficiently familiar with the aims of the projects, nor sufficiently well-grounded in the specific subject matter, to help effectively in the organization or in the follow-up work that was expected of them; also, this isolation from the actual teaching weakened their relationship with the individual homemakers. The past year is the second year of definite effort in the opposite direction on the part of both agents and specialists, with the result of greater satisfaction and better teaching.

The wisdom of attempting only as many projects as can be adequately financed and well led is becoming more apparent to both community and county committees.

During the past year, for the first time, the communities were able to have the assistance needed for their local leaders as early in the fall as they desired.

It is hoped that the agents may make more home visits during the coming year than has been possible in the past year or so. While the use of local leaders for teaching purposes has made a large contribution in the spread of teaching and in the development of leaders, many of the problems entailed are still unsolved; one of these is the proper balancing of time between the informal teaching of homemakers direct, and the more formal teaching through the indirect means of training leaders.

Thirty-nine articles furnishing instruction material have been prepared. In addition, 47 circular letters to county-club agents, and 577 other letters, have been sent out.

The following table shows the development of the work in home demonstration during the past six years:

Year	Enrollment	Number of agents	Number of projects	Number of local leaders
1919.....	5,064	13	2	248
1920.....	4,418	12 (2 assts.)	3	640
1921.....	4,610	11 (3 assts.)	3	766
1922.....	5,430	17 (3 assts.)	3	1,189
1923.....	5,755	22 (3 assts.)	3	1,405
1924.....	6,587	23 (2 assts.)	4	1,433

Nutrition. The extension service in nutrition during the past year has extended into many new communities, has included new phases of nutrition work, and has resulted in closer cooperation with agencies interested in promoting health, such as tuberculosis associations, health departments, and schools. Through the year's work a better understanding has been developed among the home-demonstration agents and the people of the State as to the scope of a nutrition program. The majority of the counties in the State are now making plans for formulating at least a three-years nutrition program, with very definite aims of accomplishment for each year.

Thirty-six organized counties and one city have cooperated during the past year on one or more phases of the nutrition project. In 1923-24 there were 409 communities cooperating on project work led by local leaders, and in 1924-25 there have been 350 communities cooperating through local leaders. These leaders have been trained by a specialist or by the agent. Many other groups which have completed at least one year of project work, although not cooperating this year on a project basis, have done valuable work in spreading the knowledge and the practices of good food selection further in their own and other localities. Community problems in nutrition, such as establishing school lunches, influencing community meals, and improving and increasing the local supply and usage of whole cereals, milk, vegetables, and fruits, have been receiving much more attention than heretofore.

During the past year the home demonstration agents in nineteen counties have acted as county leaders or assistant county leaders in nutrition. It is interesting to note that local leaders reach more people through personal conferences than through a series of home-bureau meetings, which indicates that nutrition information is spreading far beyond the confines of the home-bureau membership. To the project leaders throughout the State is due more credit than to any other group, for the fine attitude which is increasingly being felt toward the solution of nutrition problems. The work of local leaders in each county has been supervised by the home-demonstration agent and the nutrition specialist.

The elementary food-selection subproject has been carried on this year in 146 communities. This subproject includes a study of the relation of nutrition to health, a good standard of food selection, meal planning, classification of foods, food values, and how to insure an adequate food selection the year round.

Advanced project work has been conducted in 204 communities during the year. The advanced projects are: food selection in relation to digestion; food selection in relation to the amount of food required; cost of food in relation to nutritive value; and, in one county, the feeding of mothers and children.

Lectures have been given in nine counties on prenatal, infant, and child feeding. Several lectures have been given in four counties on animal and human feeding by specialists in nutrition, animal husbandry, and poultry. This is an excellent field for cooperative work by the home and farm bureaus.

Much progress has been made in nutrition work in Cattaraugus County in cooperation with the Milbank Health Demonstration.

A health and nutrition contest was conducted by the home demonstration agent and the teachers in about one hundred rural schools in Oneida county during the past year. Two conferences were held with the teachers, to discuss nutrition work and to show them the possibilities for doing such work in their schools.

Work in nutrition with school children has been carried on in six counties. This has included the teaching of nutrition principles to children, the serving of a hot dish at the noon meal, and the cooperation of teachers, superintendents, and parents. This phase of the subject is to be continued next year as a definite project, with local leaders, teachers, and superintendents attending training meetings.

In eight counties surveys are being made to determine the habits of children in regard to food selection.

The home study course in feeding the family has been continued this year, with 161 new enrollments and 194 students carried over from last year. Of the total number, 22 have been graduated and 173 have been dropped. The present enrollment is 160 active students.

Special service to people of the State through home demonstrations has been continued this year. There have been 1947 of these home demonstrations requested throughout the State, and these have included the subjects of general food selection, indigestion, constipation, overweight, underweight, feeding in pregnancy, feeding infants, feeding the pre-school child, feeding the school child, and planning the fruit and vegetable budget for the year. The special service on the subject of indigestion has been taken care of entirely through personal letters from the specialists. Although reports are not yet complete for the year, 212 demonstrations have been reported as satisfactorily completed. The food-selection score-card demonstration has been made by all of the persons enrolled in the elementary food-selection subproject, and also by most of the persons enrolled in advanced projects in addition to those requested by other persons throughout the State.

In 350 communities actively cooperating on project work this year, there have been 993 meetings reported, with a total attendance of 11,042. Leaders have reported 9012 personal conferences, or an average of 26 to each community. There has been a spread of influence by 1821 members of nutrition groups to 7715 persons. A total of 3125 persons have reported that they have made 8926 changes in practice, which is an average of three such changes for each person. Those who have changed practices of food selection have reported 1257 results in improvement of health. There have been 226 community meals planned by nutrition leaders, at which the total attendance was 11,906. In 60 communities school lunches have been promoted and established. In 51 communities the stores are supplying a better selection of fresh vegetables, fruits, and whole cereals, and in 14 communities bakeries are now making whole-wheat bread instead of all-white bread.

A great deal of personal service has been given by specialists, in addition to the training of agents and leaders, and the performing of other field work. There have been 1214 personal letters written by specialists, besides a number of circular letters. The three nutrition specialists have spent 233 days in field work, and have held 251 training meetings with a total attendance of 3062.

Foods. One specialist has spent full time on the food project. The number of counties engaged in this project has increased, and progress on the local-leader basis has been encouraging. In many cases the leaders are former teachers, but some of the strongest and most successful are homemakers with long experience. This experience is often valuable in determining the needs of the women in the community. Possibly the best guide is determined by the questions or problems which these leaders bring back for discussion.

The work has included five subprojects: food preservation, food preparation, county-fair exhibits, school hot lunches, and milk utilization. The goal of the project is the adoption by homemakers of higher standards in food preparation and preservation, which will result in better nutrition. With this aim in view it is necessary for the specialists to attempt to instill an appreciation of good standards, and impart a knowledge of the best equipment and the fundamental principles involved in the best methods of preservation and preparation of simple foods. The increased use of such foods as milk, fruit, vegetables, and whole-wheat flour, is especially encouraged. The teaching is done through local-leader training meetings, demonstrations, exhibits, and bulletins. A short-time subproject consisting of four or five lessons has been found to be the most successful method for use in this work.

The first subproject, on food preservation, was conducted in ten counties and one city in 1924-25, on the local leader basis. The work included the application of different methods for the successful canning of fruits, vegetables, and their combinations, and of meats, and the principles to be followed in the making of jellies, jams, conserves, and candied fruits and vegetables.

Subprojects on food preparation were developed in twelve counties. This work included instruction in the fundamental principles involved in the preparation of milk and cheese dishes, fruits, vegetables, and whole-wheat flour, and stimulation of an increased use of these products as a result of skill in their preparation.

Assistance with exhibits at county fairs was given to fifteen counties. In each county definite plans were developed in cooperation with the fair committee and the home bureau. In revising the premium list, it was possible, by the elimination of undesirable articles, to increase the premiums, add articles which should be exhibited, and, in general, find room for worth-while exhibits. It was found possible to include the whole-wheat project in the county-fair premium list. Special effort has been made to standardize and classify these exhibits, as well as to eliminate the "ringer," the "repeater," and the "faker." On the whole, in all the counties taking this work, the quality of exhibits has been much higher and a real improvement in standards is apparent.

When the food-preservation and food-preparation projects are completed, the group has a community exhibit. The meeting is held in the grange hall, the school, a laboratory, or any available building. The judging is done by the specialist, the county leader, or the home demonstration agent, by means of a score card. Ribbons are given and the prize winners are then eligible to exhibit at the county fair. When the exhibit reaches the county fair it is placed in charge of a committee

which sees that it is properly classified, arranged, and labeled. It is then judged and scored, and the prize winners may exhibit at the State Fair. By the time this final exhibit has been selected, it represents a piece of work which not only is interesting, attractive, and well done in every way, but also has real educational value. For two years home-bureau exhibits have been given a place at the State Fair. The appropriation for this was obtained through the State Federation of Home Bureaus. Ten counties were offered space, and each county was given \$200 to defray the expenses of transportation and maintenance. As food preservation and food preparation were the summer activities, they formed the background or the main part of the exhibit. The food-preparation project on whole-wheat flour formed an interesting feature.

Some work has been done, in cooperation with the junior extension specialists, on the school hot lunch. Simple demonstrations were given to the junior project leaders on the preparation of a series of simple dishes suitable for the school lunch. Organization and the necessary equipment were included.

The principal activities in food-extension work for the past year were as follows: counties visited, 12; community meetings for discussion of projects 8, attendance 765; demonstrations, 12; conferences with fair committees, 6; revision of premium lists, 5; judging demonstrations, 4; conferences regarding space, shelving, and location of exhibits, 9. Office work consisted in the preparation of material for local leaders, of lesson plans, of procedure sheets, and of exhibits; the revision of a food-preservation bulletin; and the preparation of a bulletin on the use of vegetables and one on cake making.

Clothing. The clothing project for 1924-25 has been a continuation of the program as developed during the preceding five years. One city and thirty-six home-bureau counties have cooperated, with from 100 to 1000 women enrolled in each. The aims for the year have been to raise the standards of clothing by developing right attitudes, spreading sound information, and changing practices in the selection, the construction, the care, and the wearing of clothing as it relates to health, appearance, and economical use of time, money, and energy; to find more efficient leaders, both county and local; and to obtain maximum results through more adequate supervision of the work throughout the State.

The subprojects undertaken in 1924-25, and the number of counties cooperating in each, were as follows: clothing design, 6; color in costume, 7; selection of material, and garment making, 6; choice, alteration, and use of commercial patterns, 13; dress-form construction, 36; altering the dress form, 22; covering and mounting the dress form, 30; fitting the commercial pattern, and use of the dress form, 12; underwear, 2. All of the subprojects except that on choice, alteration, and use of the commercial pattern, have been given before. This year's work on them, in the old counties, was for the benefit of new cooperators; and, in the new counties, it was the logical step in the development of the long-time clothing program.

In preparing for the subproject on choice, alteration, and use of commercial patterns, one of the specialists worked with five of the leading pattern companies, went through their plants, studied the process of

pattern making throughout, discussed with representatives of the various departments the problems in the sale and use of patterns, and procured text and illustrative material which was available only through the close cooperation established. The project was unique, in that it translated the commercial into the educational, and made possible to the women for the first time the inside story of patterns. It included study of the factors determining the choice of patterns, correct simple methods of altering them, and, from this, the alteration of ready-made clothing; and demonstrated the use of the pattern, including preparation of the material for cutting, reading patterns, placing them, cutting the material, and putting the garments together. The project correlated closely with that on design, since the patterns were studied as designs and were judged from the standpoint of the characteristics of good design as outlined in that project. The women's figures were studied as to proportion, and the fact was demonstrated that not only must a pattern be a good design in itself, but it must also make for good design in the clothed figure.

As a result of this subproject, the women's whole attitude toward patterns has changed. They have developed appreciation for the need of taking accurate measurements before buying patterns or material; of altering patterns or trying them out in muslin before cutting into expensive material; of choosing patterns in terms of type of figure and material to be used; and of using the patterns intelligently. Unquestionably the women are buying and using patterns more wisely, and for this reason are finding them infinitely more satisfactory than ever before.

Except in six counties the work was developed on the local-leadership basis. In twenty-one counties, either the home demonstration agent or her assistant acted as the county leader; in eleven counties and one organized city, qualified women chosen jointly by the county and the specialist conducted the project; and in three counties specialists were responsible for the work.

Supplementing this program, as last year, a specialist from the Department of Rural Engineering conducted sewing-machine schools in the counties requesting them; corsetières representing different corset companies supplied a limited number of lecture demonstrations on the choice and adjustment of corsets; and an instructor from Teachers College, Columbia University, held training meetings for millinery leaders in counties interested.

This year a new plan for training leaders was inaugurated. Heretofore, training meetings for leaders have been held monthly. Last fall a series of intensive training meetings was held at the College, the time required for each county being from one to three weeks, depending on the subprojects undertaken. Supplementing these, district training meetings were held for conference with the county leaders on the progress of the work during the year.

In addition to the intensive training meetings held at the College in the fall, and the district conferences supplementing them, the clothing specialists conducted 49 lecture demonstrations, observed and assisted 152 leaders, held conferences with 972 leaders and cooperators, assisted at 26 scoring and summary meetings, and observed and assisted county leaders at regular intervals. One of the specialists was on leave from February until June.

Reports received from twenty counties showed that 8000 local leaders and cooperators had made from four to fifteen changes in practice, including choice and use of equipment, choice of more becoming colors and designs for themselves and their families, better selections of patterns and material, purchase of more satisfactory ready-made clothing, correct methods of cutting and fitting, and simpler methods of construction. Approximately 25 per cent of the cooperators have reported spread of influence from one to ten persons.

Household management. In the household management work during 1924-25, an effort was made to help the women discover for themselves some of their greatest problems in housekeeping, and then to help them in solving a part of these problems. One of the greatest problems in this State is to reduce the distance necessary to be covered in the immense kitchens of the old homes. The main subproject, therefore, has been the convenient kitchen. Use of the pedometer in some of the communities showed that the women were walking from two to ten miles a day in doing their housework. The subproject was conducted in twelve counties through the local-leader training school. The work was presented in four lessons—rearrangement, equipment, working heights, and floors and walls. There were 86 communities represented in these schools, with more than a thousand women who were actually making a study of their kitchen conditions through the group method. The changes made as a result of this have ranged from a more conveniently placed paring knife to the complete regrouping of the furniture of the kitchen. All changes have been made with the idea of saving as many steps as possible and involving as small an expenditure of money as possible.

About one hundred women carried on the home-demonstration work in this project through correspondence. In some cases these women were in counties where the work was given in training schools, but they were unable to attend these schools; in other counties there have been groups who wanted the work but not enough persons to warrant the training school. In six of the counties where the project was carried on, kitchen tours were held. These tours included at least two or three kitchens which had been rearranged as the result of the work: one modern, up-to-date, well-planned kitchen; if possible, kitchens with special features, as dumb-waiters and lighting; and in some cases a poor kitchen showing possibilities of making good changes. The tours ranged from one with only six cars, to one in Ontario County with twenty-two cars and 100 persons.

The equipment-testing subproject has not been stressed this year. It has been conducted in two counties, Tompkins and Oswego, through training schools. In Tompkins County 20 communities carried on the work. At least ten different pieces of equipment were tested in each community, and pieces of equipment have been purchased as a result of this. Most of this equipment has been small and inexpensive, but of a type which made work more efficient. The equipment used for testing was loaned from the local stores, but a set has now been purchased by the county home-bureau to be loaned to the women when they desire. It is being recommended that each county home-bureau in the State have on display and for testing a good set of small equipment.

In Cayuga County, 45 women kept a time chart for seven days, showing an accurate record of everything they did for the twenty-four hours of each day. This gave them a good analysis of their work, showing plans or lack of plans, and just how much time they were taking for the different tasks; it also gave them an opportunity to study and compare methods. Many other groups have expressed an interest in this project.

House furnishing. Progress of work in the house-furnishing project during the months between October, 1924, and the end of June, 1925, comprised such activities as: (1) where no previous work had been done, demonstration lectures for the purpose of developing a greater sense of beauty; (2) demonstration lectures to women's clubs in places where no home-bureau unit existed; (3) two training schools for local leaders on such subjects as (a) arrangement of furniture and decorative objects in a room, and (b) color, its meaning and the application of it to a room; (4) one community room planned and developed completely, which proved to be very satisfactory; (5) many home visits, both in cities and in rural districts; (6) in one county the arranging of rooms from which undesirable objects had been eliminated following instruction to that effect.

Junior extension. During 1924-25 the teaching in junior-extension homemaking projects was done by two full-time specialists, each on nine months appointment. This means that for six months of the year only one person has been available for the following program:

**SIX-YEARS PROGRAM AND RECOMMENDED SEQUENCE FOR HOME-MAKING CLUB
WORK BEGINNING IN 1925, FOR GIRLS FROM TWELVE TO TWENTY YEARS OF AGE**

First year: Food selection and health.

Second year: Food selection and cost (family basis).

Third year: Clothing selection and construction.

Fourth year: Clothing selection and costs (family basis).

Fifth year: House furnishing.

Sixth year: Home furnishing (family basis).

Special project: Food preservation. To be taken any year as part of a food selection series.

Projects are being planned in home management and child care, to be added as the force of specialists and other agencies increases sufficiently to make possible their successful operation.

The junior homemaking projects aim to help in the education of girls from ten to twenty years by encouraging and directing the types of studies and practices calculated to encourage desirable attitudes, improve skill, increase knowledge, and establish better habits through greater interest and intelligent cooperation in home problems and activities relating to food, shelter, and clothing. The following phases are emphasized:

1. Greater emphasis on food preservation and nutrition projects, with special stress on health. The largest enrollment continues to be in clothing. More direct contact with the home, and closer study of individual problems by specialist, local leader, parents, and club member, are being developed.

2. The room-improvement project. This was offered for the first time this year, and has been limited to one group in a county for the year. This makes possible the careful development of the project, as well as the close supervision and instruction which are needed.

3. The necessity of seeing the homemaking projects as a complete homemaking program rather than as separate units of work. The rural girl should be encouraged to select a project in nutrition if she has already completed one in clothing, or before taking clothing if possible.

4. A higher percentage of attendance at local-leader training classes. At least one more full-time specialist is needed, to take over the home-furnishing work and to assist in the training of local leaders in clothing. This would leave one specialist's time for foods and nutrition, and to launch the home-management work.

Publications and information service. The work of the office of publications and of the information service has been in charge of Miss Canon and Miss Blinn during the year. This includes the preparation of bulletins for homemakers, and the preparation of miscellaneous publications such as mimeographed service leaflets, press articles, a service for weeklies entitled *Around our Home*, a monthly news service to the home demonstration agents, a biweekly radio service, and a correspondence service. The following statistical summary shows the number and character of publications handled:

Bulletin service:

Requests for homemakers' bulletins from July 1, 1924, to June 30, 1925 (June estimated):

From within the State.....	2,577
From without the State.....	1,848
Requests for quantities over 15.....	22,076

Total homemakers' bulletins distributed.....	26,501
Total junior bulletins distributed (October to June 1).....	50,792

Total for all bulletins.....	77,293
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Names on mailing list to receive monthly catalog of publications.....	6,432
Names on list last year.....	6,088

Increase	344
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Miscellaneous publications:

Courses of study.....	1,000
Color in costume.....	1,000
Home-bureau membership blanks.....	30,000
Covers for agents' annual reports.....	350
Health record for children.....	5,000
Self-study chart and guide for choosing commercial patterns.....	3,000
Duties of secretary (administrative leadership).....	3,000
Score cards for children—on food selection and health habits.....	15,000
Food and health habits—individual score.....	5,000
Division of responsibility in extension service.....	3,000
Attendance record of administrative leadership conferences.....	2,000
Local leader's report blank.....	1,300
Home economics in a state college.....	2,000
Trip report blank.....	5,000
Six-years home-bureau membership list.....	3,000
Community committee blanks.....	2,000
Self-study chart for patterns (reprint).....	1,000
Map of New York State.....	500
Application blank for nutrition service (reprint).....	1,000
Cards for catalog of extension leaders in counties.....	8,000
Invitations to candle-lighting ceremonies.....	500
Leaflets for candle-lighting ceremonies.....	300

Service leaflets (October 1 to June 1):

Total number of leaflets prepared.....	9
Total number of requests.....	487

Press service (October 1 to June 1):

Total number of articles prepared.....	329
Total number of printings reported on state press releases only.....	1,291
Total circulation of papers in which these articles appeared.....	4,003,599

Radio service:

Total number of talks given from March 16 to June 30.....	31
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Information service (correspondence):

Reading-course letters answered.....	381
Subject-matter letters	550
Total number of letters answered.....	931

Meteorology

As mentioned in the report for 1923-24, an appropriation of approximately \$10,000 by Congress for special farm forecasts permitted considerable expansion by the Department of Meteorology along this line. All expenses incident to the harvest-weather and fruit-spray services are now met by the United States Weather Bureau. Two men have been assigned to the work—J. C. Fisher, who has immediate supervision, and C. E. Lamoureux, who acts as assistant.

A more or less complete scheme of distribution of the harvest forecasts by telephone was carried out by the agricultural and home-demonstration agents in thirty-six counties, while eight counties in the east-central part of the State received the daily reports from station WGY at Schenectady.

The Chief of the Weather Bureau, recognizing the need for an extended educational campaign, has authorized Mr. Fisher to travel as needed in the State. During the winter months he explained the service at 39 community meetings in nine counties, to approximately 1500 persons. It is of interest to note that this is the first time the Weather Bureau has authorized the expenditure of funds for extension work.

During the past year 35,000 leaflets were distributed through the county farm-bureau organizations in explanation of the intent and scope of the service, and publicity was obtained also through the extension service publications and the rural press.

A careful verification of the forecasts for the 1924 season shows that they were accurate and dependable if used understandingly. More gratifying, however, was the response to a questionnaire; 2218 complete reports were received, and 98 per cent of those replying stated that the service was of value.

Plant Breeding

Extension activities in plant breeding serve to teach farmers to know and appreciate quality in seeds and the added value of the crops grown therefrom. They include the further task of supervising the production of an adequate supply of seed of approved varieties of the crops in question. In the main, these include wheat, oats, rye, barley, corn, buckwheat, cabbage, and potatoes. To attain these objects, lectures are given, demonstrations are held, and field and bin inspections are made.

During the past year 467 farm visits were made by members of the Department of Plant Breeding. Of these meetings, 320 were for the purpose of inspecting seed and giving advisory service to seed growers. The primary aim of the inspection service is to determine the quality of the seed from the standpoint of varietal purity and regional adaptation. Subsequent analysis of the seed when ready for market is made and reported. During the past year, 867 acres of grain were inspected for members of the State Seed Association, and considerably more than double this acreage was inspected for other agencies.

Regional tests of new and promising varieties and strains of grain were conducted in sixteen counties of the State. In all, 87 man days were devoted to this work. Comprehensive exhibits were made at the State Fair, at the Rochester Exposition, and at the College during Farmers' Week. Judging was done at five county fairs and seed shows, and several crop-seed contests were supervised.

The practice of sending samples of seed of approved varieties for exhibit and for field-demonstration purposes was continued as in previous years. Similarly, the superiority of domestic over foreign-grown red-clover seed was shown by field demonstrations in thirty-three counties, the seed being sown under supervision of the local county agent.

Considerable assistance was rendered by the department to overcome the severe seed-corn shortage in the spring of 1925. Much more than the usual care in testing seed corn before planting was taken by growers and seed purveyors throughout the State.

The volume of correspondence totaled nearly 1500 letters. Thirty-five news articles and nine circular letters were written. Contacts have been made with some of the seed-distributing agencies of the State, and very favorable responses to the good-seed program have been received. The outlook for the fuller appreciation and wider use of improved seed is encouraging.

Plant Pathology

In the extension work of the Department of Plant Pathology, emphasis has been placed during the year, as in the past, on the control of diseases of fruit and potatoes, and rather more attention has been given to the diseases of vegetable-garden crops than heretofore.

The spray-information service has been continued, as in previous years. This year sixteen counties are being served by fourteen field assistants. One of the assistants is appointed by the State Department of Farms and Markets; the others are appointed by the New York State College of Agriculture. Since April 1, A. L. Pierstorff has acted as supervisor of the special field assistants for this department. The dissemination of information obtained through recent experimental work at this station has resulted in the treatment during 1924 of at least 30,000 bushels of seed potatoes by the hot-corrosive-sublimate method. The cold-corrosive-sublimate method is still being used rather generally. In Steuben County, 200 pounds of chemical, or enough to treat 10,000 bushels of potatoes, was purchased cooperatively by the farmers in 1924. About 60 per cent of the commercial potato growers in New York treated their tubers this year.

Only one demonstration of the application of sulfur to the soil before planting, for the control of potato scab, was continued on Long Island. This method is not being advocated generally for up-state growers.

The potato variety or strain tests in cooperation with the Department of Vegetable Gardening have been discontinued in up-state counties.

In all, 11 potato tours and 39 potato field meetings were held in nineteen counties in 1924, and the attendance at these meetings amounted to 1608. Growers were taken into the field and the various potato diseases were pointed out to them. The nature and the cause of the diseases were explained and the method of control was discussed. The importance of maintaining a seed plot and keeping diseased plants rogued out was emphasized.

Potato-inspection work conducted by this department was confined to members of the New York Seed Improvement Cooperative Association, Inc., in accordance with a college policy established in 1923. Three inspectors were employed for three months during the season, and all expenses of inspection, except supervision, were paid by the growers through the certifying association. In all, 201 growers, with 357 fields and 1595.29 acres, received the inspection service.

The standard for certification has been varied again this year, and also a standard has been set to apply to the samples of the various stocks grown at the College. For the purpose of obtaining advance information regarding the suitability of certain lots of seed as foundation stock, 200 tuber samples from 27 different lots of seed were sent to Hastings, Florida, where they were planted in January and inspected in March, and the data were made available to potato-seed growers of New York. Thus the seed growers were enabled to purchase good foundation stock this spring.

For several years past, some attempts have been made to induce commercial vegetable gardeners to adopt disease-control practices which have been developed by recent experimental work. These efforts are gradually producing results. One specific instance is the installation of a drain-tile steam-sterilization outfit by one greenhouse man. This man is enthusiastic over the results he has obtained, and others may be converted by him. Demonstrations for the control of cucumber wilt were continued in three counties, and a relatively large number of growers are now following instructions to a considerable extent. A third project was the application of corrosive sublimate to cabbage seedbeds, in one county. A fourth was the testing of cabbage seed, by the culture method, for disease. Seed treatment has been recommended and is being generally practiced by most cabbage-seed growers or distributors in the State. Lectures were given on the nature, cause, and control of diseases at a school for canners and canners' field men held at the College in March. The demand for extension work on the control of diseases of vegetables is greater this year than ever before.

Bean inspection was carried on in 1924, and will be continued hereafter by the Department of Vegetable Gardening for growers who desire to raise bean seed for certification.

Considerable publicity was given to oat-smut control this spring, with the result that more seed was treated than last year. A demonstration

of the control of loose smut of wheat and barley was made especially for the instruction of growers wishing to produce certified seed.

During the winter and spring, lessons and talks were given at extension schools, community meetings, and other meetings of farmers. The correspondence carried on by the department is especially time-consuming. It requires the equivalent of a least half the time of one man throughout the year, as it is necessary in many cases to diagnose diseases from specimens that accompany letters. The office work performed during the year included the following: letters written, 2656; leaflets sent out, 48,328; new articles prepared, 38; circular letters written, 11 (circulation 1317).

Pomology

The Department of Pomology has no changes to report in its extension work. The chief problems are still those of pruning, soil management, top-working and bridge-grafting, thinning, and standardization of grades and packs. Economy and efficiency have been emphasized in all of these lines. Fruit growers have been encouraged by somewhat better prices, and this has had its effect on the interest at demonstrations and meetings. New York growers are anxious to learn of the situation in other fruit-growing regions, and the probable trend of conditions. These subjects were discussed at meetings and extension schools, under the topic *The Outlook for Orchardng*.

At this time, when there is a tendency more and more to question the costliness of education, the value and comparative inexpensiveness of the printed word has added significance. During the past year three bulletins have been prepared; one of these, *The Home Orchard and Fruit Garden*, meets a long-felt need for a publication treating the subject of fruit growing from the standpoint of the amateur and home gardener. In addition to the usual monthly contributions to the *Farm Bureau News* and the press, twelve short specific mimeographed circulars have been written, each covering a question in fruit growing. These are proving very useful to county agents in answering direct requests by fruit growers for information.

The long-term demonstrations are being continued according to the needs of the occasion. Their number is necessarily variable, some terminating each year, and others being dropped due to such cases as injury to trees and change in cooperators. One of the outstanding results the past year was a demonstration of the effect of heavy pruning on the yield of young peach trees. Five trees which were lightly pruned bore 22 fourteen-quart Jersey baskets of peaches in their fourth season. An equal number of heavily pruned trees standing in the same orchard beside those that were lightly pruned, and comparable in every way, bore 5 fourteen-quart Jersey baskets of fruit. The grower stated that the fruit from the heavily pruned trees was no better in size or color than that from the lightly pruned trees.

Poultry Husbandry

Efficiency in the production and marketing of poultry products is the keynote of the extension program of the Department of Poultry Husbandry. The breed-improvement program deals with those phases that bring production up to a high level of efficiency. The culling of poor

producers is the first essential in the work. This has been accomplished in two ways: (1) by culling demonstrations, in which interested persons are taught how to recognize the good and the poor producers by means of physical examination; during the summer months there were held 206 such demonstrations, with 3273 persons in attendance; (2) by the cooperative employment of men recommended by the College for the actual culling of flocks; the College trains and schedules the men, while the cost for the service is carried by persons having the work done; during the culling season for 1924, these paid expert cullers worked in thirty-four counties and handled 233,371 birds, from which 29.5 per cent were eliminated as poor producers.

Poultry certification continues to show its value with each of the farms which function as breeding centers. The influence not only of the breeding, but of general-management education, on these farms is evident. Last year the number of birds certified was 38,087 on 231 farms in forty-six counties. The responsibility for certification is wholly carried by the New York State Cooperative Certification Association, Inc., which pays the full costs of examination, banding, and the necessary records.

The resident-poultry-extension-specialist farm-management project on Long Island has been discontinued in order to emphasize similar work with groups of persons in other parts of the State. The demand for extension work in cost accounting and management is increasing. The same is true regarding disease control and marketing.

The third annual New York State Production Poultry Show was held at the College in December. Interest in production shows continues to increase, as was indicated by the response. More than 1000 birds were exhibited. Features of this show are the demonstrational judging and the illustrated lectures on breeding and management.

A summary of the extension activities of the department follows:

Extension schools, 19:

Demonstrations, 87; attendance, 2160

Lectures, 9; attendance, 374

Demonstrations:

Culling, 206; attendance, 3273

Disease, 17; attendance, 519

Miscellaneous, 7; attendance, 93

Tours:

Demonstrations, 33; attendance, 2182

Lectures, 19; attendance, 971

Three tours with out-of-state poultrymen

General lectures, 187; attendance, 5129

One radio talk broadcast from WGY

Conferences, 14; attendance, 240

Days spent with exhibits, 42

Shows judged, 15

Farm visits:

Certification, 121

Other visits, 578

Junior project:

Demonstrations, 101; attendance, 2939

Lectures, 246; attendance, 7134

Conferences, 75; attendance, 322

Home visits, 74

Tours, 2 (1 to Washington, D. C., with 70 boys, girls, and leaders in the party)

Paid culling, 34 counties; 233,371 birds examined, 68,747 (29.5 per cent) birds culled; total cost, \$4016.75; average cost per bird culled, 5.8 cents.

Rural Education

For some time past, distribution of the Cornell Rural School Leaflet by the Department of Rural Education has been made only on request. It is safe to say that during the past year as much time has been spent in discouraging as in encouraging this distribution. The following table shows the distribution from July 1, 1924, to June 30, 1925:

Leaflet	Size of edition	Number distributed prior to July 1, 1924	Number distributed during 1924-25	Number on hand May 15, 1925
March, 1924.....	120,000	112,000	7,600	400
September, 1924.....	20,000	.....	19,750	250
November, 1924.....	150,000	.....	130,000	20,000
January, 1925.....	150,000	.....	130,000	20,000
March, 1925.....	150,000	.....	130,000	20,000

During this period 282 pages of manuscript were prepared for rural school leaflets, and 264 pages were printed and distributed. The correspondence of the department up to the end of April totaled 2837 letters. The exhibit of work done by rural-school children of the State was held during Farmers' Week, as usual. The department spent 26 days in the field, holding 9 training meetings for 50 persons; participated in 4 conferences, with 600 persons; and gave 20 lectures, at which the aggregate attendance was 4048.

Rural Engineering

The extension work of the Department of Rural Engineering is conducted under five subprojects, as follows: (1) to promote better land drainage; (2) to promote the better use and repair of gas engines and other farm and home machinery; (3) to promote the installation of sanitary water-supply and sewage-disposal systems; (4) to encourage the betterment of farm buildings; (5) to extend junior project work in farm-mechanics subjects.

In drainage, the economic depression has for the time being limited the interest in extensive undertakings. Tile drain was laid, to the extent of 11,085 rods, to serve approximately 1100 acres of land; and 8000 rods of open ditch was constructed, which will make possible the drainage of 2210 acres of land now nearly unproductive. Practically all of this drainage has been installed largely by the individual labor of the farmers. The projects actually installed are being indicated by signs, and will stand for years as demonstrations of the benefits from drainage.

In machinery, practically all of the extension work takes the form of schools, which were given during the past year as follows: four-days gas-engine schools, 13; advanced gas-engine schools, 3; tractor schools, 2; one-day shop schools, 27; three-days shop schools, 6; one-day sewing-machine schools, 107; total, 158. The schools were in session for a total of 455 half-days. The total number of men and women reached was

2565, and the total number of contacts for all department specialists in the schools was 13,422. The average attendance per session was 19.5 and the largest average attendance for a school was 43.

The 107 sewing-machine schools were held in twenty-two counties, and 1552 women were in attendance. A total of 1063 sewing machines were brought to the schools and were cleaned and adjusted by the women themselves. This service alone was worth from \$3000 to \$5000 to these women, the assistance that they will extend to their neighbors will be of large additional value, and, in addition, this training should help decidedly to give confidence and skill in handling other domestic equipment. In the promotion of home conveniences the department made 35 visits in eleven counties, with a total attendance of 92 persons. In the matter of structures, considerable assistance was given by mail and 7 barn meetings were held in two counties with 169 persons in attendance.

Junior-project work in farm-mechanics subjects is an activity which the department has only lately undertaken. About 375 boys were enrolled, and their exercise material was carefully corrected at the College and returned with detailed criticisms attached. This seems an undertaking of great promise, and steps are being taken to improve and increase it during the coming year.

Rope splicing and knot tying formed the topic for 37 meetings held in seven counties. These meetings were attended by 566 men, who, because of the near approach of haying, were especially interested in the subject.

Bulletins issued during the year include: *Artificial Illumination of Poultry Houses for Winter Egg Production*; *Fitting the Farm Saws* and *The Farm Shop and Tool Equipment*.

Mention was made in the report for last year of a rural electric-line conference committee. This committee, after considering the broad aspects of the situation carefully, prepared a statement of the case as they saw it and presented it to the association of power companies. A conference of representatives of the power companies, the farming interests, and the New York State Public Service Commission, was then called by President Sloan, of the Empire State Gas and Electric Association. Later the power companies appointed the Rural Service Committee to consider rates, contracts, and general policies, and in addition continued their technical Rural Lines Committee.

Rural Social Organization

The extension work of the Department of Rural Social Organization has continued to grow during the past year, with the addition of the services of an instructor who has devoted most of her time to rural dramatics. Training schools for recreational leadership, 28 of which have been held in nineteen counties with a total attendance of 1133, have taken most of the time of one specialist. The other specialist has conducted 24 training classes for leaders in dramatics in fifteen counties, at which 162 communities and 247 organizations were represented. These training classes in dramatics were of service in helping to develop dramatic leaders for the Little Country Theaters.

Although the main emphasis has been on the training schools, considerable work has been done on other projects also. The loan library of plays has been continued, and a loan library of books for rural leaders has been established. Requests have been received from 580 persons, and 3480 plays have been lent.

Vegetable Gardening

In the extension work of the Department of Vegetable Gardening, emphasis is placed on the following topics: economical methods of production; the more general use of seed of known origin and value; better and more uniform methods of grading and packing vegetables for market; more intelligent use of manures, fertilizers, and green manures; and better planning of home gardens.

More attention has been given by the extension specialists to the bettered program, during the past year, than to any other phase of gardening.

In the cauliflower work, a superior strain of seed was located in 1923 and a supply of 100 pounds of this seed was purchased by an organization in Erie County for use in 1924. The growers estimated that this seed produced a crop worth \$200 per acre more than that from other strains used, due to the larger proportion of first-class heads. This 100 pounds of seed furnished plants for more than 200 acres of cauliflower. As a result of demonstrations, most of the cauliflower growers in the State had good strains of seed. The practice of buying seed of celery, cabbage, and a few other crops, a year in advance, for testing, has been advocated by the department for a number of years and is now being practiced by a large and increasing number of growers. This has resulted in large savings.

In the case of potatoes, selected lists of growers and dealers of certified seed are furnished to the county agents so that they can at all times advise farmers where good seed can be procured. Similar information is furnished in regard to field beans, except that not all of the seed listed are certified.

During the past few years an attempt has been made by the specialists to improve the grading of vegetables. Considerable attention has been given to lettuce and potatoes, and progress can be reported. Lettuce growers in the important producing regions have agreed on a set of grade standards based on the tentative grades suggested by the Bureau of Agricultural Economics of the United States Department of Agriculture. This is a definite and important step in advance, in the marketing of New York lettuce.

As a result of extension and demonstration work, celery growers have adopted a small crate which is a great improvement over the large one used a few years ago. Due to the better keeping of the celery and the lesser breakage of the crates, it is conservatively estimated that the value of the product is increased 50 cents per crate, which would add at least \$400,000 to the growers' returns. Lettuce growers in the most important producing regions have agreed to use one size of lettuce box instead of the three sizes formerly in use in this State.

The second school for canners' field men was held at the College from the 6th to the 9th of January, 1925, with an attendance of 60, an increase of 14 over the preceding year. Many of those in attendance had also attended the school held in 1924. Instruction was given by eight departments of the College; by Dr. C. G. Woodbury, of the National Canners' Association and by Dr. C. A. Magoon, of the United States Department of Agriculture.

Farm study courses in vegetable gardening had an enrollment of 320 on June 30, 1925. The interest of these students has been good, as is indicated by the 361 complete lessons sent in by them during the year. Four students were awarded certificates for completion of courses.

Home-gardening extension has been an important phase of the work of the department. The most effective work along this line has been that done in cooperation with the nutrition specialists of the College of Home Economics. In addition to lectures, information has been given through a series of garden articles for the daily and weekly press.

Most of the garden-extension work with boys and girls is carried on in cooperation with county club agents. This work, however, is by its means confined to children who are regularly enrolled in project schools. Naturally, the schools visited are commonly those having several garden club members; but the specialist usually talks to the whole school. The talks deal with the eating of vegetables as well as with the growing of them. This is a part of the cooperation of the department with the College of Home Economics.

The juvenile granges have afforded another opportunity for contact with farm boys and girls. Programs on gardening topics prepared by the department for juvenile grange meetings have been used extensively in this State, and to some extent in other States.

Specialists in the department spent 328 days in the field and 40 days *en route*; held 19 demonstrations and demonstration meetings with an attendance of 405; conducted 67 conferences with an attendance of 40; made 238 farm visits and inspections; gave 455 lectures attended by 27,179 persons; held 7 training meetings with an attendance of 75; wrote 89 articles comprising 241 pages; revised one bulletin and wrote one extension bulletin; and wrote 76 circular letters (circulation 2672) and 2798 other letters.

FINANCIAL SUMMARY

A summary of the receipts and expenditures for the year covered by this report is here appended. A complete and detailed statement of funds from all sources used by the State College of Agriculture appears in the annual report of the Comptroller of Cornell University. Copies of that report may be obtained on application.

REPORT OF THE DIRECTORS

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1924	Receipts (college and Smith-Hughes) 1924-25	Expenditures 1924-25	Balance	
						Lapsed	Unexpended June 30, 1925
State	1923-24 Maintenance.....	\$1,377,105.00	\$ 126,319.93	.....	\$ 71,260.14	\$55,059.79	.....
	1924 Deficiency (for fuel, light, power, and water).....	26,500.00	26,500.00	.....	26,500.00	.....	.....
	1924 Deficiency (for repairs).....	2,000.00	730.16	.....	727.06	3.10	.....
	1924 Reappropriation for printing departmental reports and bulletins.....	3,221.20	3,221.20	.....	3,221.20	.....	.....
	1924-25 Maintenance.....	1,429,160.00	1,429,160.00	.....	1,313,237.13	.....	\$115,922.87
	1924-25 Supplementary maintenance.....	16,500.00	16,500.00	.....	14,548.27	.....	1,951.73
	1924-25 Course of study in marketing and agricultural business.....	45,000.00	45,000.00	.....	44,286.88	.....	713.12
	1925 Deficiency (for fuel, light, power, and water).....	39,000.00	39,000.00	.....	19,932.46	.....	19,067.54
	1925 Deficiency (for county junior-extension work).....	17,100.00	17,100.00	.....	13,800.00	.....	3,300.00
	1925 Reappropriation for printing.....	7,424.68	7,424.68	.....	3,790.28	.....	3,634.40
Total.....		\$2,963,010.88	\$1,710,955.97	.....	\$1,511,303.42	\$55,062.89	\$144,589.66
Federal	Morrill and Nelson.....	\$ 20,000.00	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
	Hatch and Adams.....	27,000.00	27,000.00	.....	27,000.00	.....	.....
	Smith-Lever.....	198,634.11	198,634.11	.....	197,950.22	\$683.89	.....
	Smith-Hughes.....	.....	*(2,946.61)	\$24,269.74	22,944.89	.....	*( \$1,621.76)
	Total.....	\$245,634.11	\$242,687.50	\$24,269.74	\$267,895.11	\$683.89	*(\$1,621.76)
College	Tuition and fees } .....	.....	\$49,433.57	{ \$ 82,985.52	\$422,580.13	.....	\$47,485.29
	Sales and services }	.....	.....	{ 357,646.33			
	Total.....	.....	\$49,433.57	\$440,631.85	\$422,580.13	.....	\$47,485.29
	Grand total.....	.....	\$2,003,077.04	\$464,901.59	\$2,221,778.66	\$55,746.78	\$190,453.19

* Overdrafts on Smith-Hughes Fund covered by subsequent remittances from the State Department of Education.

CONCLUSION

It is a pleasure to record, in conclusion, our appreciation of the generous contribution of time and thought given to the problem of the College of Agriculture, by which you have very greatly aided us in the work of administration. We are under similar obligation to the responsible representatives of the State Government by whom the needs of the College have been considered.

Respectfully submitted,

CORNELIUS BETTEN,

*Director of Resident Instruction
and Acting Dean.*

C. E. LADD,

Director of Extension.

R. W. THATCHER,

Director of Experiment Stations.

INDEX

	PAGE
A	
Agricultural Economics and Farm Management, extension work.....	54
Agricultural Economics and Farm Management, research.....	18
Agronomy experimental fields, outlying.....	15
Agronomy, extension work	56
Agronomy, research	20
Alfred, experimental work at.....	15
American Agriculturist fellowship	9
Animal Husbandry, extension work	57
Animal Husbandry, research	23
Apiculture, extension work	61
Apiculture library, establishment of.....	10
Appropriations of Legislature for 1925-26.....	7
Atwood, M. V., resignation.....	12
B	
Beekeeping. <i>See</i> Apiculture.	
Bernard, L. L., temporary appointment.....	13
Betten, Cornelius, report	7
Botany, extension work	60
Botany, research	24
Building program	11
C	
China, plant-improvement work	12
Churchville, experimental work at.....	15
Claassen, P. W., work in China.....	13
Conventions held at College	14
Cope, J. A., appointment	13
County and town fairs	43
D	
Dairy Industry, extension work.....	60
Dairy Industry, research	26
Directors, report of	7
E	
Enrollment of students	13
Entomology, extension work	61
Entomology, research	28
Experiment-station activities	15
Experiment stations, provisions of Purnell Act.....	8
Extension methods, research in	42
Extension schools	43
Extension Service	39
F	
Faculty. <i>See</i> Staff.	
Fair exhibits	43
Farm bureaus	44
Farmers' Week	40
Farrand, Livingston, letter of transmittal	5
Fellowships	9

	PAGE
Field Days, Junior	40
Financial summary	81
Floriculture and Ornamental Horticulture, extension work.....	63
Forestry, extension work	64
Forestry, research	31
G	
General Education Board, grant from.....	9
Geneva, agricultural experiment station at.....	17
Gifts	0
Grants	3
Guba, E. F., resignation	12
H	
Home bureaus	46
Home Economics, College of, designation	10
Home Economics, College of, separate report postponed.....	7
Home Economics, extension work.....	65
Horticultural investigations. Hudson River Valley.....	10
I	
Indian extension work	40
International Education Board, cooperation of College with.....	11
International Education Board, work of	7
Ithaca station, research activities at	17
J	
Junior extension	47
Junior Field Days	40
L	
Ladd, C. E., report.....	7
Lantern slides, loan of	41
Larsen, O. H., temporary appointment	11
Laura Spelman Rockefeller Memorial	9
Leonard, M.D., temporary reappointment	13
Leonard, Nellie, temporary appointment	49
Long Island vegetable research farm	15
Love, H. H., work in China	12
M	
Mann, A. R., leave of absence.....	7
Meteorology, extension work	74
Moore, C. B., appointment	13
Moses, Winifred, resignation	12
N	
Nanking, University of, plant-breeding work	12
Nason, Edith H, appointment.....	13
News service	48
News-writing schools	49
New York Agricultural Experiment Station at Geneva.....	17
New York State Bankers' Association scholarships.....	9
New York State College of Home Economics, establishment of.....	10
New York State Grange scholarships, withdrawal of.....	10
P	
Perkins, Nellie L., appointment	9, 13
Petry, L. C., appointment	13
Plant Breeding, extension work.....	74
Plant Breeding, research.....	31

	PAGE
ant Pathology, extension work.....	75
ant Pathology, research	33
omology, extension work	77
omology, research	35
oultry Husbandry, extension work.....	77
resident's letter of transmittal.....	5
ublication, Office of	48
ublications, distribution of.....	49
ublications, list of	51
ublications, summary of.....	54
arnell Act	8

R

adio service	42
research activities	15
ral Education, extension work	79
ral Education, research	36
ral Engineering, extension work	79
ral Social Organization, extension work	80

S

scholarships	9
hramm, J. R., resignation.....	12
arp, P. F., appointment.....	13
aeth, J. N., appointment.....	13
aff, changes in	12
ate Fair exhibits.....	43
udent enrollment	13
udy courses	49

T

hatcher, R. W., report.....	7
hatcher, R. W., work with President's Agricultural Commission.....	13
own and county fairs.....	43

V

vegetable Gardening, extension work.....	81
vegetable Gardening, research.....	37
vegetable research farm, Long Island.....	15
ineyards, experimental, outlying.....	16

W

illiams, Faith M., appointment.....	13
illiamson Cooperative Vegetable Growers' Association fellowship.....	10
ilson, W. M., retirement.....	12
oodchucks, campaign for control of.....	63

State of New York

New York State College of Agriculture
at Cornell University

Cornell University Agricultural Experiment Station
New York State Agricultural Experiment Station

Thirty-Ninth Annual Report

1926

LIVINGSTON FARRAND, President of the University

A. R. MANN,
Dean

R. W. THATCHER,
Director of Experiment Stations

CORNELIUS BETTEN,
Director of Resident Instruction and Acting Dean

C. E. LADD,
Director of Extension

Transmitted to the Legislature January 15, 1927

Thirty-Ninth Annual Report
of the
New York State College of Agriculture at Cornell
University, and of the Cornell University
Agricultural Experiment Station

STATE OF NEW YORK

DEPARTMENT OF AGRICULTURE AND MARKETS

Albany, January 15, 1927

To the Legislature:

In accordance with the provisions of the statutes relating thereto, I have the honor to transmit herewith the Thirty-ninth Annual Report of the New York State College of Agriculture at Cornell University, as a part of the Annual Report of the Department of Agriculture and Markets.

BERNE A. PYRKE,
Commissioner of Agriculture and Markets.

PRESIDENT'S LETTER OF TRANSMITTAL

July 31, 1926

the Governor of the State of New York,
Albany, New York.

the Secretary of the Treasury,
Washington, D. C.

the Secretary of Agriculture,
Washington, D. C.

the Commissioner of Farms and Markets,
Albany, New York.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

The Act of the Legislature of the State of New York, approved April 1, 1906, providing for the administration of the New York State College of Agriculture at Cornell University, contains the following provision: "The said university shall expend such moneys and use such property of the State in administering said college of agriculture as above provided. It shall report to the commissioner of agriculture in each year on or before the first day of December, a detailed statement of such expenditures and of the general operations of the said college of agriculture for the year ending the thirtieth day of September then next preceding."

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the year 1925-26 of the New York State College of Agriculture and the Agricultural Experiment Stations under the administration of Cornell University.

It is a pleasure to acknowledge, even in a year in which virtually no change in the appropriations is recorded, the courtesy and consideration which the needs of the College have received from the officials of the State and which have characterized also the transaction of the routine of business between the State and the University. It is true that the unexpected crisis forcing still further delay in the erection of the plant-industry building has produced in the college staff a profound discouragement; but the situation has been so often and so fully presented that a restatement of

the facts is not made in this report. The University renews its request that the building needs of both the College of Agriculture and the College of Home Economics be given adequate consideration.

In the accompanying report, record is made of the legislation forming a part of the state reorganization program and transferring the relations of the College of Agriculture and the experiment stations from the Department of Farms and Markets to the Department of Education. The old relationship, largely formal though it was, brought the Commissioner of Farms and Markets and the institution into helpful contact, and it is a pleasure to acknowledge the cooperative spirit that has always prevailed. There is much to be said for relationship with either the Department of Agriculture or the Department of Education. With the former, the College and the stations share closely related functions in connection with farm problems and there is opportunity for cooperation and for adjustment of fields of activity. Fully as cogent are the reasons for relationship with the Department of Education. The policy of the State of New York with reference to higher education is somewhat involved and needs clarification, and the degree of coordination brought about by having all state-supported institutions of education report through one agency would seem desirable. In the long run, less confusion will probably result from having regulatory and educational efforts in relation to agriculture separate than from having two state agencies concerned in education. At any rate, the Legislature, following the recommendation of the Hughes Commission, has decided on this arrangement, toward the success of which the University and the College and the experiment stations will gladly cooperate.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE, 1925-26

June 30, 1926

To the President of the University:

SIR: We have the honor to submit a report of the New York State College of Agriculture and the Agricultural Experiment Stations under the administration of Cornell University, for the fiscal year 1925-26. A separate report is made for the New York State College of Home Economics, formerly organized as a unit in the College of Agriculture.

The reorganization of the administrative agencies of government in the State of New York

In common with all other agencies of the State Government, the College of Agriculture has been greatly interested in the question of what new administrative relationships or procedure might result from the reorganization of the State Government undertaken during the past year. In the autumn of 1925 there was adopted by popular vote an amendment to the State constitution which provides that all civil, administrative, and executive functions of the State Government are to be assigned to twenty departments described in the amendment. A commission under the chairmanship of Mr. Charles E. Hughes was appointed to study the structure of the State Government and to recommend how the provisions of the amendment might be carried into effect. The report of this commission was placed before the Legislature in 1926, and constitutes a comprehensive statement of recommended administrative relationships among the many units of the State Government.

In the report just referred to, it was recommended that the New York State Colleges of Agriculture, Veterinary Medicine, and Home Economics, Cornell University, the New York State College of Forestry at Syracuse University, and the State School of Clay Working and Ceramics at Alfred University, "be transferred to the Department of Education, with the proviso that these several colleges and schools shall continue to be administered in respect to their educational policies and activities, including research, by the institutions with which they are now associated, and with the further proviso that the Regents of the State of New York shall maintain supervision over their several budgets and expenditures." It is recommended further that the relations of the New York Agricultural Experiment Station at Geneva to the College of Agriculture be not disturbed.

The State Legislature of 1926 carried into effect the provisions of the constitutional amendment along the lines recommended by the commission. The education law was amended by the addition of Article XI, dealing with the organization and functions of the new Department of Education.

Section 315 of this article, dealing with the units placed under the administration of Cornell University by the State, follows:

New York state college of agriculture; New York state college of home economics; New York state veterinary college; New York state agricultural experiment station. 1. The New York state college of agriculture at Cornell university established by chapter six hundred and sixty-five of the laws of nineteen hundred and four, and which is administered and maintained in the manner and for the purposes provided for in section ten hundred and thirty-nine of the education law; the New York state college of home economics at Cornell university, established and maintained as provided for in section ten hundred and thirty-nine-b of the education law; the New York state veterinary college, established by chapter one hundred and fifty-three of the laws of eighteen hundred and ninety-four, and which is administered and maintained in the manner and for the purposes provided for in section ten hundred and thirty-eight of the education law; and the New York state agricultural experiment station at Geneva established by chapter five hundred and ninety-two of the laws of eighteen hundred and eighty, and administered by Cornell university as provided for in section ten hundred and thirty-nine-a of the education law, are hereby continued, and shall hereafter be under the supervision of the education department, subject to the provisions of this section.

2. Such colleges and station shall continue to be administered as to the establishment of courses of study, the creation of departments and positions, the determination of the number and salaries of members of the faculties and other employees thereof, the appointment and employment thereof, the maintenance of discipline and as to all matters pertaining to their educational policies, activities and operations including research work, by Cornell university as the representative of the department.

3. The department shall maintain general supervision over the requests for appropriations, budgets, estimates and expenditures of such colleges and station. All moneys received by Cornell university from state appropriations for such colleges and station, or derived from other sources in the course of the administration thereof, shall be credited to separate funds and shall be used exclusively for the colleges and station for which such moneys were appropriated or are made available. The moneys so received from state appropriations shall be expended upon vouchers approved by the commissioner of education, as the chief administrative officer of the department, when and in the manner authorized by the regents of the university.

4. The provisions of sections ten hundred and thirty-eight, ten hundred and thirty-nine, ten hundred and thirty-nine-a and ten hundred and thirty-nine-b of the education law, in so far as they are not inconsistent with this section, shall apply to the New York state veterinary college, the New York state college of agriculture, the New York agricultural experiment station at Geneva and the New York state college of home economics at Cornell university, respectively, and such colleges and station shall continue to be administered and maintained in the manner and for the purposes therein specified, except as otherwise provided in this section.

The provisions of this law have the cordial approval of the University and of the colleges and station concerned. They transfer the relationships maintained by the College of Agriculture and by the experiment station at Geneva, from the Commissioner of Farms and Markets to the new Department of Education. These new relationships are sure to be helpful and harmonious. They could not well be more satisfactory than the heretofore maintained with the present Commissioner of Farms and Markets and with his predecessors in office, to whom the College and station make profound acknowledgment of indebtedness for long years of courteous cooperation, which will happily continue in spite of the severance of formal connections.

Other legislative enactments

State appropriations. The budget requests presented to the legislative committees in October, 1924, were made out in the usual manner and included the work in home economics as part of the College of Agriculture without making a separation of maintenance items for the two college units, and the appropriation bill was passed in that form. The separate creation of the New York State College of Home Economics in February, 1925, made necessary a division of the funds, and the Legislature provided that the allocations to the two colleges should be made with the approval of the Governor, the chairman of the Senate Finance Committee, and the chairman of the Assembly Ways and Means Committee. The allotments made were based on the records of previous years, during which the present College of Home Economics was organized as a School of Home Economics within the College of Agriculture, and there were necessarily involved more or less arbitrary divisions in the salaries of more than thirty persons in administrative and clerical positions whose services pertain to both colleges. The appropriations of the following year were of course made separately for the College of Agriculture and the College of Home Economics.

The appropriations made for 1926-27, and applying to both colleges, exceeded those of the preceding year by \$19,950, of which \$10,000 is in the form of fuel, light, power, and water. Of the remainder of the increase, \$250 is applicable to travel, \$500 to equipment and supplies, \$3200 to the summer school, and \$1800 to the work of the farm and home bureaus.

The buildings. No appropriations were made toward the building program. The plan of construction approved by the university trustees was authorized by the Legislature of 1920, and appropriations toward it were made in 1920, 1922, and 1923. Subsequently the amendment allowing \$10,000 for state construction annually for ten years received popular approval, and it was generally understood that the immediate needs of the College of Agriculture were to be provided for through the funds so made available. Governor Smith, in his recommendation to the Legislature of 1926 regarding the allotment of the first year, included the proposed plant-industry building at a cost of \$1,250,000. Following the Governor's subsequent recommendation made toward the close of the session, this amount was diverted to other purposes. The conditions under which the College is thus forced to continue its work have repeatedly been referred to in the annual reports. Suffice it to say that they are becoming progressively worse, with decided injury to the work carried on and with discouragement to the staff. Meanwhile various preparatory operations are going on. The new greenhouses are completed and the service connections to them are in process of construction. The work of converting the old heating plant into a garage and storeroom is also under way. The rural-engineering laboratories, which were moved to their new site at the animal-husbandry group last summer, were virtually ready for use by the opening of the college year, and in their improved condition have been found well adapted to their purposes. These several changes make it possible to carry on the construction of the plant-industry building, when funds are provided, with a minimum of interruption in the

work of the departments. Provision has still to be made for greenhouse space, since some departments not provided for in the new ranges will have less area at their disposal, when the old houses make way for the plant-industry building, than they now have.

County extension boards. During the 1926 session, the State Legislature passed a law enabling counties to appoint county vocational education and extension boards. These county boards, if appointed, will represent the State Department of Education in administering junior extension work, in the place of the single school district through which the State Department's funds are paid for county club work at the present time. There will be no direct relationship between the State College of Agriculture and the county vocational education and extension boards, but the county junior extension board may cooperate with the county vocational education and extension boards and may receive some funds from the State Department of Education through such cooperation. In order to permit of the most effective cooperation under the new law, the relationships between the State Department of Education and the State College of Agriculture, in the supervision of the junior extension work, have been clarified somewhat in a new memorandum of understanding between these institutions.

Special funds

During the year there has been created the Max Schling Loan Fund for students specializing in floriculture. The fund is established through the generosity of Mr. Max Schling, of New York City, who wishes to devote the income from certain educational services which he renders to professional florists, to helping worthy students who are specializing in floriculture. The interest available from the fund is to be used in making loans to such students.

An anonymous donor has given the sum of \$150 to be used during 1926-27 for prizes for excellence in public discussion of agricultural problems. The donor hopes to establish these prizes on a permanent basis and the details of the competition are in process of formulation.

The following special temporary fellowships have been renewed during the year: The Champlain Valley Fruit Growers' fellowship for the study of diseases and pests affecting apples, \$1000 annually for two years from April 1; the Western New York Farms Corporation fellowship for studying the diseases and pests attacking muck crops, \$1000 annually for two years from April 1; the Union Sulphur Company fellowship for the study of the control of cereal rusts by the application of fungicides in dry form, \$1000 for one year from April 1; the Potash Importing Corporation fellowship for the study of economic factors influencing the use of fertilizers, \$3750 for one year from November 1; and the Bayer Company, Incorporated, fellowship for the study of chlorophenolate of mercury as an agent for the control of plant diseases, \$1250 annually for two years from May 1.

The Herman Frasch fellowships donated by the Union Sulphur Company expired on April 1. The amount of \$3220.88 left in the fund established, and also an automobile purchased, were donated to the University for the use of the Department of Plant Pathology.

Changes in the college staff

The staff of the College of Agriculture, having expanded rapidly during the past twenty-five years and being recruited from young men only now coming to maturity, has suffered the loss of strikingly few members by death. This year has been signalized by the passing of Mr. Charles Edward Hunn on January 4, and of Professor William Alonzo Stocking on February 3.

Mr. Hunn gave the College thirty-one years of faithful and unique service in the field of ornamental plant propagation. He had an unusual knowledge of the requirements of plant species, which made him a skilled workman and an effective teacher. Fortunately, the College is to have his work carried on and enlarged by his son, Chester J. Hunn, recently appointed assistant professor of ornamental horticulture.

Professor Stocking's death, at the age of fifty-four, closed a career of active teaching service in the College covering twenty years. After being graduated from the Connecticut State Agricultural College in 1895, he came to Cornell as a student, receiving the degree of B. S. A. in 1898 and of M. S. A. in 1904. He began his teaching in this College as an assistant professor in 1906, and three years later was promoted to a full professorship and assumed also the headship of the Department of Dairy Industry. In a State having very large and diversified dairy interests this was a great educational and administrative responsibility, and Professor Stocking discharged it with marked ability. During 1913-14 he undertook still further responsibilities by serving as Acting Director of the College. In 1923 he resigned his administrative position as head of his department, in order to devote himself exclusively to teaching and research in his chosen field of dairy bacteriology. Unfortunately he was given only a short time in which to renew his long-interrupted studies, but he leaves, nevertheless, a record of fine accomplishment and a memory of a most kindly and beneficent personality.

The staff has lost by resignation Howard A. Stevenson, assistant professor in extension service, whose resignation took effect on August 1, 1925; Clarence V. Noble, assistant professor of farm management, who left on June 30, 1926; and Adelin S. White, acting assistant professor of rural education, who left also on June 30, 1926.

During the year fifteen members of the staff have availed themselves of the privilege of sabbatic leave. Dean Mann has continued his work for the International Education Board in Europe, and will have resumed his work at the College by September 1. Dr. C. H. Myers has succeeded Dr. H. H. Love in the plant-breeding project carried on in China in cooperation with the University of Nanking and with the International Education Board, and referred to in the annual report of the College for the preceding year. Professor G. A. Works was granted special leave during most of the year to engage in a study of certain administrative problems of university libraries. He also participated in a survey of the schools of Porto Rico. Professor H. E. Ross spent the year in organizing, for the Argentinian Government, laboratories for the commercial production of modified milk for infants.

The following appointments were made, effective during the year: E. F. Hopkins, assistant professor of botany; Adelin S. White, acting assistant

professor of rural education; M. S. Kendrick, assistant professor of rural economy.

The University Board of Trustees has approved the appointment of W. A. Brownell as assistant professor of rural education; of C. J. Hunn as assistant professor of ornamental horticulture; of Emma Conley as acting professor of rural education; and of A. F. Henrici as acting professor of bacteriology, for one year—all effective July 1, 1926. The College loses, by transfer to the College of Arts and Sciences in August, Dr. R. P. Sibley, who during the past six years has fulfilled the duties of the secretaryship of the College with striking success.

The University Division of Education

A significant educational venture initiated during the year is an affiliation on the part of the Department of Education in the College of Arts and Sciences and the Department of Rural Education in the College of Agriculture. While the aims of these two departments have been quite different, there existed in certain lines of work some overlapping that might be avoided; and it was hoped also that a better program for the training of prospective teachers and school administrators might be set up if these units were closely coordinated. In addition, it seemed clear that certain functions, such as the placement of teachers, would best be carried on by one university office. Accordingly, with the approval of the university faculty and the university trustees, there was established under the auspices of the university faculty a Division of Education, and the following principles were approved relative to its development:

1. That the establishment of the Division shall not be regarded as superseding existing jurisdiction of the Faculties and of the Departments concerned or as changing the administrative relations between those Faculties and their respective Departments of Education.
2. The Faculty of the Division may determine which of the courses now offered by the Departments shall be included in the Division.
3. The Division may offer courses not offered by either Department.

A similar movement, less formal in character, had previously brought the scattered courses in the biological sciences to a greater degree of unification.

In a large university composed of several colleges and many departments it is difficult to avoid duplication of effort. What is far more serious is that the units established shall devote themselves so exclusively to their own special interests that it becomes difficult to pool the resources of the institution for purposes that happen not to fall within the established departmental lines. Particularly likely is it that departments separated into the logical subdivisions of the sciences shall not respond readily or fully to the needs of other groups classified rather by professional or occupational interests. There would seem, therefore, to be good reason to establish, in addition to the formal departmental or college units, more informal groupings for the purpose of meeting the instructional needs of different classes of students. The present affiliation of the two Departments of Education therefore exemplifies a procedure that might with varying degrees of formal organization be more generally useful.

Occupations of former students

In the annual report of 1921-22, and again in that of 1923-24, there was included a summary statement of the occupations then being followed by all former students, both graduates and nongraduates. Mr. A. W. Gibson has conducted a similar inquiry regarding the students of the twelve-weeks winter courses up to and including the year 1923-24. This makes possible a comparison of the percentages of the various types of students going into the categories of occupations defined in the report for 1923-24. During the period studied, there were 2539 graduates of the four-years course, 2146 nongraduates, 1190 special students, and 6061 students of the winter courses. The number whose occupations could not be learned amounted to 10.5 per cent for the graduates and 29.9 per cent for the winter-course students. Of occupations reported, the percentages are as follows:

	Graduates (per cent)	Non- graduates (per cent)	Special students (per cent)	Winter- course students (per cent)
Farming	24.1	19.5	46.2	53.4
Agricultural business	13.0	7.9	11.6	12.4
Agricultural and scientific professions.....	7.4	3.0	2.6	1.7
Agricultural teaching, research, and extension	27.6	4.6	7.9	1.1
Non-agricultural work	27.9	64.9	31.7	31.4

These statistics confirm what general considerations would lead one to expect of these groups of students. The graduates of the regular course, while a quarter of them go into direct operation of farms, are virtually the only ones who undertake the more strictly professional occupations related to agriculture. It is to be expected that the special and winter-course students, who come specifically for practical farm courses, would, in large proportion, return to farming; but it is perhaps somewhat surprising to find that more of these than of the graduates ultimately find their way into non-agricultural pursuits. Evidently the members of these groups, while they are predominantly young men who have been working on farms, have but little time or capital invested either in professional training or in farm property, and many are apparently free to shift about in relatively unskilled occupations.

Student enrollment

The enrollment figures given in previous annual reports include students in agriculture and home economics, and the apparent sharp decrease from the figures given last year is due to the fact that the two units are now separately enumerated. As the State College of Home Economics was set off as a separate unit after the second term of the year 1924-25 had begun, there was no separate registration of students in the two divisions during that year, but the schedule of courses followed is in general quite different for the two groups; therefore a fairly accurate division can be made, and this has been done in the following tabulation of the students in agriculture in so far as it relates to 1924-25. The record for 1925-26 is, of course, based on separate registrations. There is for this year a marked gain in students in the four-years course and in graduate students, and an equally marked decrease in winter-course and summer-school students.

The outstanding feature of the student enrollment is the continued increase of graduate students, and no other feature can be so indicative of the qualifications of the staff of instruction and research. Some of the departments, such as plant breeding and agronomy, have always been to a large extent devoted to research and the training of graduate students, and in practically all of the departments these functions now constitute a major responsibility. In some departments there are seventy-five or more different persons registered for either major or minor work toward an advanced degree, and in more than one there exists the unfortunate necessity of assigning these students to desks by hours because of lack of space.

	1924-25	1925-26
Freshmen	248	269
Sophomores	171	175
Juniors	170	160
Seniors	145	161
	734	765
Special students	22	6
Winter-course students:		
Agriculture (general)	67	62
Dairy Industry	43	41
Poultry Husbandry	50	17
Fruit Growing	10	11
Flower Growing	8	8
Vegetable Gardening	2	....
	180	140
Graduate students	231	257
Summer-school students	575	587
	1,742	1,774
Less number counted twice.....	101	121
	1,641	1,653

Special meetings

As in other years, the College has conducted a number of schools of short duration and has been privileged to be host to conferences in which members of the staff have cooperated, as well as to gatherings of a more informal character. The following events were held in 1925-26:

	Attendance
1925 poultry-judging and -breeding school, June 29 to July 3, 1925....	103
Summer school for town and country pastors, July 6-18, 1925.....	73
New York State Seed Improvement Association, July 27, 1925.....	100
Beekeepers, summer meeting, July 28, 1925.....	125
Annual conference of extension workers, August 10-14, 1925.....	107
Agricultural teachers' conference, August 17-22, 1925.....	150
Home demonstration agents in nutrition, August 17-25, 1925.....	30
New York State poultry-production show, December 1-3, 1925 (82 exhibitors, 1272 birds)	(app.) 1,500
Junior project leaders' conference, December 14-18, 1925.....	25
Beekeepers' conference, January 25-30, 1926.....	60
1926 Farmers' Week, February 8-13, 1926.....	3,167
Canning-crops conference, February 16-19, 1926.....	40
Home demonstration agents' conference, April 12-15, 1926.....	45
Junior project leaders' conference, June 11-12, 1926.....	30
Junior field days, June 23-25, 1926.....	1,561
Indian field days, June 25, 1926.....	42
Cortland County Farm Bureau picnic, June 25, 1926.....	500
Chemung County Farm Bureau picnic, June 30, 1926.....	250

RESEARCH AND EXPERIMENT-STATION ACTIVITIES

Two significant events made possible the inauguration of much new research work during the year covered by this report. These were the availability of the first year's appropriation under the federal Purnell Act, and that of the funds appropriated by the Legislature of 1925 for the development of investigations with canning crops.

New Purnell-fund projects

The passage by the federal Congress of the Purnell Act, its general purposes, and the general plans for its expenditure, were discussed in last year's report. The first year's appropriation under this act made \$20,000 available for experiment-station work in each State of the Union for the year beginning July 1, 1925. By the terms of the act of the Legislature of New York accepting the Purnell funds, nine-tenths of the sums to be available from this source each year were assigned to the College of Agriculture at Ithaca, and one-tenth to the State Agricultural Experiment Station at Geneva.

After careful consideration of the needs for increased research at the two institutions and of the general plans for national cooperative study of certain problems in the fields of agricultural economics, home economics, and rural social organization, it was decided to devote the first year's allotment of Purnell funds to the following projects:

At the Cornell station:

1. Studies of milk marketing. Department of Agricultural Economics and Farm Management. Leaders, H. A. Ross and Leland Spencer.
2. The marketing of potatoes and other New York State produce in New York City, Philadelphia, Pittsburg, and Cleveland. Department of Agricultural Economics and Farm Management: Leader, M. P. Rasmussen.
3. A study of merchandising practices and costs of operation of retail feed stores. Department of Agricultural Economics and Farm Management. Leader, Leland Spencer.
4. The marketing of hay in terminal and country markets. Department of Agricultural Economics and Farm Management. Leader, M. F. Thurston.
5. Study of the prices of farm products. Department of Agricultural Economics and Farm Management. Leaders, G. F. Warren, F. A. Pearson, and G. P. Scoville.
6. A study of village population and service agencies. Department of Rural Social Organization. Leader, B. L. Melvin.
7. Food consumption of farm and village families. College of Home Economics. Leader, Faith Williams.
8. Index numbers of the money cost of living in small towns and on farms in New York. College of Home Economics. Leader, Faith Williams.
9. Studies of vitamin content of foods. College of Home Economics. Leader, Adelaide Spohn.
10. Antirachitic value of eggs. College of Home Economics. Leader, Adelaide Spohn.

At the Geneva station:

1. A botanical and morphological study of vegetable varieties. Division of Horticulture. Leader, F. H. Hall.

The inauguration of this new work not only has produced some satisfactory results from the progress of the investigations themselves, as shown in the departmental reports below, but also has stimulated the general spirit of research, especially in those departments to which the new projects have been assigned.

The increase in the Purnell funds from year to year up to the maximum of \$60,000 in 1930, will permit the strengthening of the work already under way and the inauguration of new projects in other fields of study, and is certain to have a very beneficial effect upon the whole research organization at the two experiment stations.

Canning-crops investigations

The Legislature of 1925 made available the sum of \$20,500 for the year covered by this report, to inaugurate investigations relating to the production of fruit and vegetable crops for use in canning, and to the control of the insect pests and plant diseases which affect these crops. Immediately after the passage of the bill, a special advisory committee was organized consisting of the Director of Experiment Stations (as chairman), the heads of the Departments of Vegetable Gardening, Plant Pathology, and Economic Entomology at the College of Agriculture at Ithaca, and the heads of the Divisions of Horticulture, Plant Pathology, and Entomology at the State Experiment Station at Geneva. This committee laid out a comprehensive plan for the new investigations. Three new members of the staff at Geneva were appointed as associates in research in Horticulture, Entomology, and Plant Pathology, respectively. A 63-acre farm, lying half a mile north of the experiment-station grounds at Geneva, was leased for a period of ten years, and active field and laboratory studies of the several problems as planned by the committee was begun. The progress which has been made on these projects is reported in the annual report of the Geneva station. For the coming year, the appropriation for these special canning-crops investigations has been made a part of the regular budget of the Geneva station, so that their active continuation is assured.

Work at outlying stations

The investigations conducted in the agronomy fields at Alfred and at Churchville, and those at the Long Island vegetable research farm at Riverhead, the plans for which have been outlined in detail in former reports, were continued without interruption this year.

The lease for the experimental vineyard at Urbana was terminated at the close of the crop season in 1925, as most of the work for which the project was established had been completed. The investigations of the special problems of grape culture are now all concentrated at the vineyard at Fredonia. These studies are under the direct supervision of the Division of Horticulture of the Geneva station, and reports of progress are included in the annual report of that station.

The horticultural investigations in the Hudson River Valley were continued along the same lines as in former years. Facilities for the laboratory studies of plant diseases and insect pests were much improved by the removing of the laboratories to a commodious and well-equipped room in the basement of the Physics Building at Vassar College, at Poughkeepsie. The field studies of fertilizers and cover crops for orchards have given very definite and encouraging results, which are reported in detail in the publications of the Geneva station for the year.

The State Agricultural Experiment Station at Geneva

As in previous years, the detailed report of the work and expenditures of the New York State Agricultural Experiment Station at Geneva has been published separately as the Forty-fifth Annual Report of that station. It shows the progress which has been made in the regular work of the station and in the new investigations with canning crops. Copies of the report are available for distribution to all who request them.

Attention should be called here, however, to the critical condition which has resulted from the veto, by the Governor of the State, of the appropriation which was made successively by the Legislatures of 1924 and 1925 for the erection of the horticultural research laboratory building at Geneva, and the failure of the Legislature of 1926 to make any provision for this building. In his second veto message the Governor indicated his opinion that this building "should be provided for from the bond issue now pending." But the funds available from the first year's part of the bond issue were all allotted to other purposes, and no provision was made for the building at Geneva. In the meantime the critical condition of lack of laboratory space has grown steadily worse. New duties have been assigned to the station, which have involved additions to the staff. These new workers have had to be crowded into quarters already overcrowded. This has made impossible the providing of satisfactory laboratory facilities for the work now under way. In addition, it has made absolutely impossible the carrying out of plans for the further development of the research work at the station which have had the enthusiastic support of the people of the State for the past four years. This serious handicap is materially lessening the efficiency of the work at Geneva, and it is sincerely hoped that the present almost intolerable conditions may be speedily remedied by early provision of the necessary funds for the erection of the horticultural laboratory building.

Research activities at Ithaca

In former years, it has been customary to include in this annual report brief abstracts of all of the published results of the research activities of the several departments of the College, including both the articles which have appeared as memoirs or bulletins of the Cornell University Agricultural Experiment Station and those which have been published in technical journals and agricultural papers. The number and volume of these published results of research has now grown so great that it is no longer feasible to include abstracts of all the articles in this report. Instead, there

is given on pages 43 and 44 a list of the memoirs and bulletins which have been published during the year, and in the sections on the following pages which are devoted to the research work of the several departments of the College an attempt is made to give a brief summary of the more important results of these researches as well as of those reported in the form of articles in technical journals.

While it is obviously impossible to give, within the limits of this report anything like a complete review of the extensive and varied research work which was carried on in the several departments during the year, the following brief summary will serve to outline its more important aspects.

Agricultural Economics and Farm Management

The research work in the Department of Agricultural Economics and Farm Management is in the following general fields: costs of production of farm products; organization of farms for efficient operation; prices and their trends; marketing of farm products, including the various steps in the process from the first transfer through local buyers or associations to the final distribution to the consumer through the terminal markets; problems of farm ownership, including land tenure, tenancy and its taxation, utilization of marginal and submarginal lands; farm finance; and cooperative associations for buying and selling farm products. A total of 45 separate projects, or problems, in these several fields were under investigation during the year, and a number of these were brought to the point of publication. Significant facts with reference to the total income and the net labor income of fruit farms in Niagara County, and in the relative costs of marketing fruit and other farm crops through cooperative associations in contrast with other marketing agencies, were developed and reported. Two studies of New York's system of taxation and the relation of taxes to prices of farm products were completed and prepared for publication. The series of economic studies of dairy farming was continued to include the production of Grade B milk with cash crops and mixed hay roughage and the production of cheese-factory milk. Several phases of the marketing of milk and of other perishable food products in large cities were investigated; these studies show wide variations in the efficiency and economy of terminal marketing arrangements. New projects, dealing with the economics of the use of tractors and trucks by farmers, the financing of electrical installations for rural use, the appraisal of farm land, the marketing of vegetable crops, and a general economic study of poultry farming similar to that which has been made of dairy farming, were recently inaugurated.

Each successive year sees the general program of research in this department organized more definitely, and directed more specifically toward problems which are parts of a comprehensive study of the economic aspects of agriculture, from the first production of the primary products of the farm through to their final distribution to the ultimate consumer.

The following articles prepared by various members of the department in addition to the experiment-station publications listed elsewhere in this report, were published in technical journals and agricultural papers during the year:

- William Allen — Forty years of adjustments in farm lands in New York State. Farm econ., no. 31:410. 1926.
- James E. Boyle — Marketing of agricultural products. (Book, published by McGraw-Hill Book Company.) 1925.
- R. B. Corbett — Prices received for fruit in mixed and in straight car lots. Farm econ., no. 26:314-315. 1925.
- R. B. Corbett — Costs of packing fruit on farms. Farm econ., no. 26:318-320. 1925.
- R. B. Corbett — Some trends in the numbers of fruit trees. Farm econ., no. 27:327-330. 1925.
- I. F. Hall — Dairy barns. Farm econ., no. 31:401-402. 1926.
- M. S. Kendrick — Taxes paid by farmers. Farm econ., no. 32:421-422. 1926.
- M. S. Kendrick — The gasoline tax, why have it? Amer. agr., January 9, 1926.
- M. S. Kendrick — Why autos are taxed. Amer. agr., January 23, 1926.
- M. S. Kendrick — The gasoline tax — what to do with it? Amer. agr., February 27, 1926.
- M. S. Kendrick — Industrial versus individual margins. Amer. econ. rev., March, 1926.
- E. F. Lininger — Express rates on eggs. Farm econ., no. 31:404-407. 1926.
- E. F. Lininger — First-class express rates. Farm econ., no. 31:407-409. 1926.
- E. G. Misner — The pure-bred Holstein situation. Farm econ., no. 32:414-415, 420-421. 1926.
- W. I. Myers — Farm business analysis. Journ. farm econ. 8:75-85. 1926.
- W. I. Myers — Some principles of successful cooperation. Cornell countryman 23:183-184. 1926.
- W. I. Myers — Choosing and buying a farm. In The book of rural life, 3:1814-1824. 1925.
- E. A. Perregaux — Credit extended by Chenango County feed stores. Farm econ., no. 31:402-404. 1926.
- M. P. Rasmussen — Survey shows gains on vegetable sales are not excessive. Press [Pittsburgh], February 26, 1926.
- M. P. Rasmussen — Marketing in New York City. Post [New York], March 3, 1926.
- M. P. Rasmussen — Some facts concerning the marketing of New York State fruits and vegetables. Packer [New York], April 10, 1926.
- I. A. Ross — Factors affecting the demand for dairy products. Produce review and American creamery, 61:418-419. 1926.
- I. A. Ross — Where is the cream line going? Dairy products merchandising, 6⁵:32-36. 1926.
- I. A. Ross — The percentage of fat in New York State milk. Farm econ., no. 31:393-396. 1926.
- I. A. Ross — Seasonal variation in the demand for milk in New York City. Farm econ., no. 31:396-399. 1926.
- I. A. Ross — Day-of-the-week variation in sales of milk and cream in Greater New York. Farm econ., no. 34:448-451. 1926.
- I. A. Ross — Effect of price on the sales of butter on retail milk routes in Greater New York. Farm econ., no. 34:451-453. 1926.
- P. Scoville — Labor incomes on a western New York fruit district. Farm econ., no. 27:330. 1925.
- P. Scoville — Mortgages in 1913 and 1924. Farm econ., no. 27:331. 1925.
- P. Scoville — Farm management surveys in New York State. Farm econ., no. 28:341-343. 1925.
- P. Scoville — Apple production and prices. Farm econ., no. 29:357. 1925.
- P. Scoville — An important factor to consider in deciding on how many acres of potatoes to plant in 1926. Farm econ., no. 33:431-436. 1926.
- P. Scoville — Hay production and prices. Farm econ., no. 33:439-440. 1926.
- P. Scoville — Potato production. Farm econ., no. 31:388-389. 1926.
- Spencer — Facts and figures relating to credit. Flour and feed, September, 1925.
- Spencer — Credit at the country store, what it costs and who pays for it. Amer. agr., December 12, 1925.
- Spencer — Relation of the price of milk to the rate of production. Farm econ., no. 29:358-360. 1925.

- L. Spencer — The New York milk and cream supply. *Cornell countryman* 23:115-116. 1926.
- L. Spencer — How the New York market is supplied with milk. *Dairymen's League news*, April 30, 1926.
- L. Spencer — The New York milk and cream supply. *Farm econ.*, no. 30:363-368. 1925.
- L. Spencer — Effect of price changes upon the rate of milk production in Broome and Chenango Counties (New York). *Farm econ.*, no. 31:399-401. 1926.
- F. J. Walrath — Prices paid for wheat at Ithaca, New York. *Farm econ.*, no. 33:436-439. 1926.
- G. F. Warren — Students of agriculture. *Farm econ.*, no. 29:355-356. 1925.
- G. F. Warren — A good time to buy a farm. *Farm econ.*, no. 29:356. 1925.
- G. F. Warren — Taxation of farm land. *Nat. Tax Assoc. Bul.* 11:198-200. 1926.
- G. F. Warren — Why taxes are high. *Farm econ.*, no. 32:422-423. 1926.
- G. F. Warren — The agricultural situation. *Cornell countryman* 23:8, 22. 1926.
- G. F. Warren and F. A. Pearson — Adjusting agriculture to deflation. *Farm econ.*, no. 31:389-390. 1926.
- G. F. Warren and F. A. Pearson — August crop estimate. *Farm econ.*, no. 27:326-327. 1925.
- G. F. Warren and F. A. Pearson — Cash and future prices of wheat. *Farm econ.*, no. 32:424-426. 1926.
- G. F. Warren and F. A. Pearson — Crop yields per acre. *Farm econ.*, no. 31:390-391. 1926.
- G. F. Warren and F. A. Pearson — Dairy and beef cattle. *Farm econ.*, no. 31:379-380. 1926.
- G. F. Warren and F. A. Pearson — Decrease in farm capital. *Farm econ.*, no. 29:357. 1925.
- G. F. Warren and F. A. Pearson — Prices of farm products in New York. *Farm econ.*, no. 31:378. 1926.
- G. F. Warren and F. A. Pearson — Feed prices. *Farm econ.*, no. 33:431. 1926.
- G. F. Warren and F. A. Pearson — Hogs. *Farm econ.*, no. 31:381-382. 1926.
- G. F. Warren and F. A. Pearson — Horses and mules. *Farm econ.*, no. 31:382-384. 1926.
- G. F. Warren and F. A. Pearson — House rents in cities. *Farm econ.*, no. 31:371. 1926.
- G. F. Warren and F. A. Pearson — Index numbers of variability. *Farm econ.*, no. 34:455-456. 1926.
- G. F. Warren and F. A. Pearson — Number of apple trees. *Farm econ.*, no. 31:386-388. 1926.
- G. F. Warren and F. A. Pearson — Poultry. *Farm econ.*, no. 31:380-381. 1926.
- G. F. Warren and F. A. Pearson — Price cycles for livestock. *Farm econ.*, no. 31:386-387. 1926.
- G. F. Warren and F. A. Pearson — Price of purebred and common beef cattle. *Farm econ.*, no. 34:443-448. 1926.
- G. F. Warren and F. A. Pearson — Purchasing power of farm products for 59 years. *Farm econ.*, no. 26:316. 1925.
- G. F. Warren and F. A. Pearson — Ratio of the price of corn to other farm products. *Farm econ.*, no. 26:316-318. 1925.
- G. F. Warren and F. A. Pearson — The agricultural situation. *Farm econ.*, no. 29:354-355. 1925.
- G. F. Warren and F. A. Pearson — Wages of farm labor related to farm prices of grain and potatoes and to prices of farm land. *Farm econ.*, no. 27:331-334. 1925.

The following manuscripts have been accepted for publication as bulletin of the experiment station:

- John F. Booth — An economic study of farmers' cooperative associations in New York.
- R. B. Corbett — An economic study concerning the operations of fruit and vegetable shippers in western New York.
- R. B. Corbett — The costs of packing fruit in the cooperative packing houses in western New York in 1922 and 1923.

- M. S. Kendrick — An index number of farm taxes in New York, and its relation to farm prices, general prices, wages, and so forth.
- E. G. Misner — Economic studies of dairy farming in New York. VI. Grade B milk with cash crops and mixed hay roughage, crop year 1922.
- E. G. Misner — Economic studies of dairy farming in New York. VII. Grade B milk with cash crops and mixed hay roughage, crop year 1923.

Agronomy

The past year brought to a rather definite stage the research in the Department of Agronomy on the relation of growing crop plants to the activities and the numbers of certain microorganisms in soils. After many years of work on this problem it has become possible to trace the disappearance of nitrates under growing crops not accounted for by absorption to microbial activities, and to show the influence of plant growth on the increase in numbers of certain bacteria. As a corollary of this, the rate and amount of nitrate accumulation in the soil has been connected with the carbon-nitrogen ratio of the plant tissues incorporated with the soil. The length of time required for nitrate accumulation to reach its peak is thus dependent on the carbon-nitrogen ratio. It is not until the excess of carbon is removed by oxidation that nitrates accumulate in large quantity. This study of the decomposition of plant tissues furnishes a basis for the investigation of some of the principles involved in crop rotations.

For several years it has seemed advisable that certain experiments in the management of field crops should be transferred to the land at the State Experiment Station near Geneva. The advantages to be anticipated are: (1) a soil more representative of the good agricultural land of the State; and (2) a more uniform soil, and hence one better adapted for experiments conducted in another agricultural region of the State. This year, through the cooperation of representatives of the Geneva station, the plan has been put in operation and members of this department have undertaken the conduct of the experiments with the assistance of members of the Division of Agronomy at the Geneva station.

The following papers by members of the department, in addition to the experiment-station publications listed elsewhere, have appeared in technical journals during the year:

- J. A. Bizzell — Removal of plant nutrients in drainage waters. *Amer. Soc. Agron. Journ.* 18: 130-136. 1926.
- Elias Panganiban — A preliminary study of the effect of pressure upon the nitrogen changes of the soil. *Philippine agr.* 14: 235-242. 1925.

Animal Husbandry

A new method for the determination of the effect of varying feeding practices on bone structure in swine, and its relation to paralysis, was worked out during the year and is being applied in specific studies of mineral nutrition.

A careful analysis of the very complete and comprehensive records of the dairy herd for the past fifty years was planned, and work upon it was begun this year. It is hoped that this may throw much light on such questions as the effect of abortion upon individual and herd milk production,

the percentage of increase in numbers of animals in a typical dairy herd, the relative potency of sires of different breeding, and the comparative efficiency of varying systems of feeding and herd management.

A study of the possibility of using skimmilk powder in rearing calves has been arranged.

In cooperation with the Department of Agricultural Economics and Farm Management, plans were perfected for a thorough study of the efficiency of varying rations for dairy herds as shown by the records of nearly one thousand dairy farms which have been made during the series of economic studies of dairy farming, and work was begun on this study.

Botany

As in previous years, many investigations are in progress in the Department of Botany, some by members of the staff, others by graduate students. Among these are investigations on the taxonomy of the flora of central New York; investigations on the floral anatomy of various plants with reference to their relationship and descent; and studies on the translocation of materials in trees. Researches relating to the control of banana wilt in the Tropics, and studies on the germination of orchid seeds, are being continued. A cytological study of corn (this being a cooperative investigation between the department and the United States Department of Agriculture) is in active progress. Several aspects of weed-seed germination, especially as affected by conversion of the plants into silage, are being studied. A study of weed control by spraying with solutions which are selectively toxic to weeds and not to grasses and cultivated plants, showed that sodium chlorate or potassium-chlorate solutions are very efficient for this purpose. Sulfuric acid and other chemicals also are being tested for this use. The relation of catalase activity to the vitality of seeds and the vigor of seedlings is in progress. The breeding of potatoes for resistance to blight has reached a stage where several completely resistant strains are being increased for distribution to growers.

The following articles written by members of the department, in addition to the experiment-station publications listed elsewhere, have appeared in technical journals during the year:

- E. F. Hopkins and F. B. Wann—The effect of H-ion concentration on the availability of iron. *Bot. gaz.* 81: 353-375. 1926.
- L. Knudson—Hydrogen-ion concentration and plant growth. *Amer. Soc. Agron. Journ.* 17: 711-716. 1925.
- E. L. Proebsting—The relation of stored food to cambial activity in the apple. *Hilgardia* 1: 81-106. 1925.
- K. M. Wiegand—*Oxalis corniculata* and its relatives in North America. *Rhodora* 27: 113-124, 133-139. 1925.

The following papers are ready for publication:

- E. F. Hopkins—Effect of wounding on the sugar content of potato tubers.
- E. F. Hopkins—Further studies on the effect of low temperatures on the respiration of potato tubers.
- L. Knudson—Utilization of various sugars by green plants.
- F. B. Wann and E. F. Hopkins—Further studies on the effect of H-ion concentration on *Chlorella*. The alkaline limit for growth.
- F. B. Wann and E. F. Hopkins—A study of the effect of the concentration of iron on *Chlorella*.

Dairy Industry

Rapid progress has been made in the research program of the Department of Dairy Industry during the past year. Significant contributions are reported in the fields of dairy manufacturing, the chemistry of milk and its products, the chemistry and bacteriology of eggs, dairy bacteriology, and bacterial physiology. These are described in detail in papers written by members of the department. The following research papers were published during the year:

- I. C. Hall — The reduction of selenium compounds by sporulating anaerobes. *Journ. bact.* 11: 407-408. 1926.
- I. C. Hall and B. Howitt — The anaerobic bacteria of the oval cavity. *Soc. Exp. Biol. and Med. Proc.* 22: 541-543. 1925.
- W. V. Price — An algebraic method of proportioning ice cream mixes. *Journ. dairy sci.* 9: 243-250. 1926.
- P. F. Sharp — Wheat and flour studies, V. Plasticity of simple flour-in-water suspensions. *Cereal chem.* 3: 40-56. 1926.
- P. F. Sharp — Glutenin in flour. *Assoc. Off. Agr. Chem. Journ.* 8: 678-679. 1925.
- P. F. Sharp and O. M. Schreiner — Wheat and flour studies, VI. Effect of yeast fermentation on the proteins of flour. *Cereal chem.* 3: 90-101. 1926.
- J. M. Sherman — The production of catalase by an anaerobic organism. *Journ. bact.* 11: 417-418. 1926.

The following papers have been accepted for publication and are in process of being printed by various technical journals or trade papers:

- E. S. Guthrie — Shrinkage of print butter.
- E. S. Guthrie — The Seidenberg turbidity test.
- E. S. Guthrie — Whey butter.
- W. V. Price — A method of interpreting the scores of judges of dairy products.
- P. F. Sharp — Wheat and flour studies, VIII. The composition of wheat and mill products from frozen and non-frozen wheat harvested at various stages of maturity.
- W. O. Whitcomb and P. F. Sharp — Wheat and flour studies, VII. Milling and baking tests of frozen and non-frozen wheat harvested at various stages of maturity.

Additional papers are ready for publication, as follows:

- J. D. Brew and R. C. Fisher — Transportation of milk and bacteria-count limits.
- H. R. Curran and J. M. Sherman — The growth of bacteria.
- E. S. Guthrie — A statistical study of creamery operation.
- G. Knaysi and J. M. Sherman — Some chemical factors which influence the body of artificial buttermilk.
- R. P. Myers — The effect of hydroxyl ion concentration on the thermal death rate of *Bacterium coli*.
- W. V. Price — The manufacture of Cheddar cheese from milk pasteurized by the holder method.
- W. V. Price — Cheddar cheese from pasteurized milk.
- P. F. Sharp — Wheat and flour studies, IX. The density of wheat as influenced by freezing, stage of development, and moisture content.
- P. F. Sharp and R. Whitaker — The relation of the hydrogen-ion concentration of egg white to its germicidal action.
- P. F. Sharp and T. J. McInerney — The colorimetric determination of the hydrogen-ion concentration of milk, whey, and cream.
- J. M. Sherman and P. S. Prickett — Evidence of the formation of monosaccharides in the lactic-acid fermentation of disaccharides.
- J. M. Sherman and P. S. Prickett — The relative efficiency of continuous and intermittent heating in sterilization.

Entomology

The Department of Entomology has under way a large amount of research work in the fields of general systematic entomology, and parasitology in its relation to public health, which has only an indirect relation to agricultural welfare. But in the fields of economic entomology, fish culture, and beekeeping, its investigations are directly concerned with problems of immediate application in practice.

In economic entomology a method was perfected for the production in large quantities of fly larvae for use as food for young pheasants, in order to supply the necessary animal food for chicks which are being reared in captivity before they are able to procure it naturally; a study of the parasites of the oyster-shell scale was completed, and a method for transferring the infecting parasites to new areas was perfected; and a method for the control of the spruce-gall aphid was worked out in detail.

In the fish-culture studies, some remarkable variations in the rate of growth of trout fry have been observed and are to be made the basis of selection for parent stock from which it is hoped to develop a fast-growing strain of desirable food and game fish. Also, studies of the food habits of trout and of methods of artificial feeding of these fish in captivity brought definite results which have been published. Studies of parasite infections of game fish are under way and have already given promising results.

In beekeeping, one of the most remarkable achievements of the year has been the assembling of what is probably the most complete library dealing with bees that is in existence in the world. In addition, a study of the relation of poisonous dusts used as insecticides in orchards, to the pollination of fruit blossoms by bees, was completed, which shows that under certain conditions of moisture and wind velocity bees may get toxic doses of arsenic from clover or other crops in fields adjoining orchards which have been dusted. Studies of conditions within the bee cluster in winter were continued. Arrangements are now nearly completed for the inauguration of extensive studies of the bacterial diseases of bees.

The following papers written by members of the department, in addition to the experiment-station publications listed elsewhere, have been published in technical journals during the year:

- P. W. Claassen — Mud Pond. Lloyd Library. Bul. 27 (Ent. ser. 5): 15-17. 1926.
- P. W. Claassen and C. K. Sibley — Collecting methods for invertebrates. Lloyd Library. Bul. 27 (Ent. ser. 5): 83-86. 1926.
- C. R. Crosby — Some arachnids from the Carlsbad cave of New Mexico. Ent. Soc. Washington. Proc. 28: 1-5. 1926.
- C. R. Crosby and S. C. Bishop — A new genus and two new species of spiders collected by *Bufo quercicus* (Holbrook). Florida ent. 9: 33-36. 1925.
- C. R. Crosby and S. C. Bishop — Notes on the spiders of southeastern United States with descriptions of new species. Elisha Mitchell Sci. Soc. Journ. 41: 165-212. 1926.
- W. T. M. Forbes — The second abdominal pleurite in the higher Coleoptera. Psyche 32: 290-292. 1925.
- W. T. M. Forbes — Lepidoptera. Lloyd Library. Bul. 27 (Ent. ser. 5): 109-127. 1926.
- W. T. M. Forbes — The wing-folding patterns of the Coleoptera. New York Ent. Soc. Journ. 34: 42-98. 1926.
- G. W. Herrick — Methods of control for two shade-tree pests. Journ. econ. ent. 18: 630-632. 1925.

- G. W. Herrick — Some long-standing and some more recent insect pests with hints on methods of control. New York State Hort. Soc. Proc. 71: 4-17. 1926.
- O. A. Johannsen — A new sciarid from the eastern United States. Ent. news 36: 266-267. 1925.
- O. A. Johannsen — Diptera. Lloyd Library. Bul. 27 (Ent. ser. 5): 147-164. 1926.
- J. G. Needham and P. W. Claassen — The bog cover. Lloyd Library. Bul. 27 (Ent. ser. 5): 19-22. 1926.
- E. F. Phillips — The grasshopper mite. Bee world 7: 27. 1925.
- E. F. Phillips — The disinfection of combs containing American foul brood. Bee craft 8: 27. 1926.
- E. F. Phillips — Bee diseases and the queen. Bee craft 8: 87. 1926.
- E. F. Phillips — Une source de confusion dans l'investigation des maladies des abeilles adultes. Internat. Apicult. Cong. Proc. 1924: 164. 1926.

Floriculture and Ornamental Horticulture

The major part of the activities of the Department of Floriculture and Ornamental Horticulture for the year were centered around the erection and equipment of the new range of greenhouses. In these, it is hoped to be able to inaugurate some comprehensive studies of the physiology of flowering plants. Meanwhile, the variety studies of roses, primroses, peonies, and iris are being continued. A bulletin covering the bearded-iris varieties was prepared for publication during the year.

Forestry

The outstanding accomplishments during the year in the research work being carried on in the Department of Forestry were: a study of yield and growth of hardwoods on an estate at Hyde Park, New York; the remeasurement of the permanent sample plots in the plantations started more than twenty years ago at Axton; the inauguration of experiments in killing undesirable or "weed" trees by the use of sodium arsenite, to prevent production of root suckers and stump sprouts; the continuation of experiments in the eradication of weeds in forest nurseries by chemical sprays; the establishment of plantations of hardwood species on cultivated soil at Phelps, New York; the completion of the study of the resistance of red pine to fire damage at Varna; and the making of a survey of an area in Tompkins County, representative of forest conditions in southwestern New York, which illustrates the methods that may be used in investigating the forest resources of the State.

The compilation and tabulation of the field data of all the above-mentioned studies was completed, during the winter, and work was started on the accompanying reports. Two of these will probably appear as experimentation bulletins, the others as articles in technical journals.

During the year, sample plots in plantations of black locust were located and established in various counties in the State. A study of black locust is particularly important, because this is one of the few trees that may be substituted for chestnut as a post material.

In the forest nursery, seeds of numerous trees native to other parts of the United States and to foreign countries, notably Japan, are being grown, to test the adaptability of these trees to the climatic and soil conditions of New York.

Home Economics

The research work in the general field of home economics is supported in part by funds available to the New York State College of Home Economics and in part by Purnell funds, the latter being assigned by law to the College of Agriculture. While the activities under the Purnell funds might properly come within the purview of this report, it seems desirable that all of the research in home economics at this institution should be described in one place, and readers interested are therefore referred to the report of the College of Home Economics for the year for information concerning home-economics research in progress here.

Meteorology

In the Department of Meteorology, work was continued during the year in the study of the relation of climate to type of agriculture and to agricultural production, but no new definite conclusions were brought to the point of publication. A discussion of the climate of Long Island was accepted for publication as an experiment-station bulletin.

Plant Breeding

The research work of the Department of Plant Breeding consists of more or less continuous studies, extending over a period of years, which have for their ultimate purpose the production of improved varieties and strains of agricultural crops. Parts of these studies involve careful investigation of the heredity, or genetics, of fundamental factors in plant breeding. These can be successfully summarized only when they are completed and ready for publication, and it happens that none of them reached the stage during the year just past.

A second type of work involves the crossing of strains, and the subsequent selection of new hybrid strains, of plants that seem to possess special merit or peculiar adaptation to some particular agricultural need. Such hybridization work is constantly in progress in the department with wheat, oats, rye, barley, corn, field beans, garden beans, cabbages, potatoes, timothy, and several silage crops including soybeans and sunflowers. The actual production of new varieties and strains is necessarily accompanied by comparisons of their quality and uses with those of existing varieties, so that an immense amount of variety testing is continually under way. A large part of this work is done in cooperation with the Office of Cereals, Crops and Diseases of the Bureau of Plant Industry of the United States Department of Agriculture, and a full and detailed report is prepared each year, covering nearly a hundred typewritten pages. It is obviously impossible to summarize even briefly this immense mass of data within the limits of this report.

Plant Pathology

Three agencies for research are active in the Department of Plant Pathology. These are: (1) the members of the instructional and research staffs; (2) graduate students; and (3) holders of industrial fellowships, who are also registered as graduate students. For the last-named

even fellowships were available during the past year. This has resulted in the organization of eighty-three separate research projects in this department. So extensive a program needs careful study as a whole in order that its parts may not become confused or overlapping. Accordingly a study was made of the general scope of the research activities in plant pathology, and a general program for research was adopted into which each existing or new project might be assigned a definite place. The following is a condensed outline of this program as it is now in operation:

- Morphological, physiological, and taxonomic studies of bacteria and fungi.
 - I. Special forms of the organism of bean anthracnose.
 - II. Study of the genus *Cercospora*.
 - III. The genera *Sclerotinia* and *Botrytis*.
 - IV. The *Pyrenomyces*.
 - V. *Poronias*.
 - VI. A new *Claviceps*.
 - VII. *Trillium* rusts.
- General investigations of several phases of a disease.
 - I. Diseases of cereals (two projects).
 - II. Diseases of ornamentals, and of wild and medicinal plants (nine projects).
 - III. Diseases of vegetables (four projects).
 - IV. Diseases of fruits (six projects).
 - V. Diseases of forest trees (three projects).
 - VI. Diseases of miscellaneous plants (two projects).
- Studies of virus diseases of plants.
 - I. Nature of cause.
 - II. Interrelation of virus diseases.
 - III. Cytological changes in host plant.
 - IV. Control of mosaic in potatoes.
 - V. Nature and control of white heart of celery.
- The nature of resistance and susceptibility.
 - I. Relation of health of plants to infection by fungi.
 - II. Specific cases.
- Environmental studies.
 - I. Temperature relations with mildew and black rot of roses.
 - II. Soil environment in relation to dry root-rot of beans.
 - III. Unproductive muck, cause and control.
 - IV. Environmental factors in lettuce tipburn.
 - V. Club-root of crucifers.
 - VI. Fire blight.
 - VII. Scab of beets, host range, etc.
- Disease-control studies.
 - I. The nature of fungicidal action.
 - A. Protectants (three projects).
 - B. The dynamics of toxic action (two projects).
 - II. Soil treatments for seedling diseases (three projects).
 - III. Dust fungicides (four projects).
 - IV. Breeding and selecting for disease resistance (three projects).
 - V. Miscellaneous studies.
 - A. Approach grafting for control of root rot in trees.
 - B. Leaf mold of tomato.
 - C. Control of fire blight in a commercial orchard.
- Mycological surveys (eight projects).

The following papers by members of the department, in addition to the experiment-station publications listed elsewhere, have been published in technical journals during the year:

- K. H. Fernow — Accuracy in potato inspection. *Amer. potato journ.* 2: 44-47. 1926.
- F. D. Kern and H. H. Whetzel — Some new and interesting Porto Rican rusts. *Mycologia* 18: 39-47. 1926.

- C. V. Kightlinger — Preliminary studies on the control of cereal rusts by dusting. *Phytopathology* 15: 611-613. 1925.
- C. V. Kightlinger and H. H. Whetzel — Second report on dusting for cereal rusts. (Abstract.) *Phytopathology* 16: 64. 1926.
- L. M. Massey — The story of fire blight and its control. *New York State Hort. Soc. Proc.* 71: 52-58. 1926.
- L. M. Massey — Treating gladiolus bulbs for disease. *Flower grower* 13: 235. 1926.
- R. A. Toro — New or noteworthy Porto Rican *Pyrenomycetes*. *Mycologia* 17: 131-147. 1925.
- D. S. Welch — A monographic study of the genus *Cucurbitaria*. *Mycologia* 18: 51-86. 1926.
- H. H. Whetzel and F. D. Kern — The smuts of Porto Rico and the Virgin Islands. *Mycologia* 18: 114-124. 1926.

The following papers are in press:

- O. C. Boyd — Investigations on the relative efficiency of some copper fungicides in the control of potato diseases and insect pests.
- Walter H. Burkholder and Albert S. Muller — Hereditary abnormalities in beans resembling certain infectious diseases.
- H. M. Fitzpatrick — Fungi in Lloyd-Cornell Reservation.
- H. M. Fitzpatrick — Mushrooms on trees.
- L. M. Massey — *Fusarium* rot of gladiolus corms.
- A. G. Newhall — The importance of controlling celery blight in the seedbed.
- H. H. Whetzel and F. D. Kern — The rusts and smuts of Porto Rico.
- H. H. Whetzel — Apple scab and its control.
- H. H. Whetzel — International Congress of Plant Sciences.

The following papers are ready to be submitted for publication:

- W. H. Burkholder — A new bacterial disease of the b. n.
- H. W. Dye — Two diseases of western New York lettuce: the bottom-rot and the stunt.
- G. R. Gage — Studies on the life histories of *Ustilago avenae* and *Ustilago levis*.
- E. F. Guba — The genus *Pestalotia* — A preliminary consideration of classification.
- R. S. Kirby — Diseases of small grains in New York State.
- J. A. B. Nolla — A new *Alternaria* disease of onions.
- V. F. Tapke — Resistant varieties and environmental factors influencing the severity and the amount of loose smut in wheat.
- H. H. Whetzel and L. R. Hesler — A textbook of plant pathology.
- H. H. Whetzel and I. E. Melhus — Biography of Joseph Rosenbaum.
- H. H. Whetzel and F. J. Seaver — A rare fungus from Bermuda.
- R. P. White — *Fusarium* wilt of tomatoes.

Pomology

In the Department of Pomology, a study of the relation of spur growth to fruit production indicated that there is no relation between the length of growth of a spur and its tendency to form blossom instead of leaf buds. Trees which are generally annual bearers may become biennial bearers, and vice versa.

A study of the pruning of grape vines indicated that greater production of materials or less respiration per unit area follows pruning, so that a definite unit area of tissue on pruned vines has more dry matter at the close of the season than the same unit area on unpruned vines.

The following papers by members of the department, in addition to the experiment-station publications listed elsewhere, have been published in technical journals during the year:

- W. H. Chandler and A. J. Heinicke — Some effects of fruiting on the growth of grape vines. *Amer. Soc. Hort. Sci. Proc.* 22: 74-80. 1925.
- A. J. Heinicke — Pollination and other conditions determining the set of fruit. *New York State Hort. Soc. Proc.* 71: 42-52. 1926.

- A. J. Heinicke — The relationships between condition of the tree, growth, and fruitfulness. *New York State Hort. Soc. Proc.* 71:216-225. 1926.
- L. H. MacDaniels — Pollination studies with certain New York apple varieties. *Amer. Soc. Hort. Sci. Proc.* 22:87-96. 1925.
- L. H. MacDaniels and A. J. Heinicke — Some results of bending young apple and pear trees. *Amer. Soc. Hort. Sci. Proc.* 22:201-204. 1925.
- J. L. Mecartney — Relation of spur growth to blossom and fruit production in the Wagener apple. *Amer. Soc. Hort. Sci. Proc.* 22:126-133. 1925.

Poultry Husbandry

In former years the research work of the Department of Poultry Husbandry has consisted largely in the accumulation of data concerning laying records, feeding practices, and general poultry-management enterprises, both at the College and from individual poultrymen, with the view of studying general-management problems. During the past few years, and notably during the period covered by this report, much progress has been made in the organization of special research problems required for the scientific understanding of poultry raising. Typical problems of this kind on which work has recently been begun, are: the physical-chemical changes that influence the economic value of eggs, and changes in these during storage; the relation of physiological characters of hens to the size, shape, and number of eggs which they produce; the relation of internal anatomy to egg production; the antirachitic factor in feeds, and its effect on bone tissue and mineral composition in chicks; the influence of ultra-violet light, sunshine, and cod-liver oil, on egg composition.

Further careful development of certain management problems has resulted in reorganization of projects dealing with the following subjects: poultry-house ventilation, lighting, and operation; the protein requirements of growing chicks; costs of incubator operations; the effect of various methods of producing, keeping, and handling eggs, upon their hatching qualities. None of these enterprises were brought to the point of publication of definite results during the year.

Rural Education

The head of the Department of Rural Education was absent on leave through most of the year, for a study of the administrative problems of university libraries. He also participated in a survey of the schools of Porto Rico and of the State of Utah. The results of these studies have been reported to the institutions which supported the different undertakings, for publication elsewhere.

Other members of the department have been engaged in studies of the aims and methods of agricultural extension teaching; studies of the activities of parent-teachers associations in rural communities; an analysis of the activities of district-school superintendents in New York; an examination of the education resources and lacks in rural communities; studies of the so-called "mental tests" and of cases of discrepancies between mental ability and actual achievement; a survey of the educational status and vocational intentions of farm boys; and a study of supervised farm experience in connection with school courses.

Rural Engineering

In connection with studies of dairy-barn ventilation conducted during the past year by the Department of Rural Engineering, a very thorough study was made of a complete King type commercial system. The results of this test confirm previous work, and new data have been obtained concerning the directing of the incoming fresh air, the diffusion of this incoming air, and the operation of "automatic" intakes. The continued use of the new air-current detector has made it possible to definitely determine the theory of air movement in and through the dairy stable. This theory is quite different from that which has previously been accepted, and will materially assist in the proper design of ventilation systems.

Work on a poultry-house-ventilation project was begun in October, 1925. This work will continue throughout the summer of 1926. It is evident that it will be necessary to continue the study for several years in order to get the necessary check data. Much of the information obtained this year is of practical importance to the poultryman and is sufficiently definite to enable the department to plan for detailed studies of certain factors and to obtain closer control over the variables affecting this problem.

Studies are being made during the crop season to determine the possibilities of making greater use of power machinery, and to ascertain the cost of the various operations from the preparation of the seedbed to the harvesting of the crops. The results at the close of the crop season of 1925 show that one operator has been able to perform more than 700 actual hours of work with one tractor. This fact has led to the suggestion of a two-operator plan, by which the tractor is in operation all the daylight hours of the day, to determine whether this method will reduce the operating cost and at the same time get the necessary work done in season.

There are many grades and kinds of lubricating oils offered on the market, at a great variety of prices. The farmer user is at a loss to know which oil he should buy, and there is no place where he can get the necessary information. Hence a series of investigations has been started, to determine, if possible, some means of giving the farmer reliable information on which to base his judgment in the purchase and use of lubricating oils. This investigation so far has pointed out the need of devising a practical apparatus with which the farmer can determine at what point a lubricating oil is no longer suitable for use in his tractor or other gas engines.

Rural Social Organization

Three projects of research were under investigation in the Department of Rural Social Organization during the year. These are:

1. A study of population trends in New York State from 1855 to 1920. This was practically completed, and its results are being prepared for publication.
2. A study of the distribution of service agencies in villages of different sizes in the State. This has resulted in the accumulation of a considerable amount of data, but analysis of the data has been delayed by work on other projects and by the absence of the head of the department on sabbatic leave.
3. Research on the structure, function, and relationship of selected villages. This work is nearly completed, and it has revealed many interesting facts which are being prepared for publication in the near future.

Vegetable Gardening

Studies of the effect of removal of suckers from sweet corn, conducted by the Department of Vegetable Gardening during the year, showed the effects of this practice to be much less significant than is commonly believed. Experiments conducted on a typical sandy soil showed that on such soils intertillage produces no beneficial results other than by removal of competition between the crop and weeds. Studies of the physical and chemical changes in celery during storage showed marked changes both in the cellular contents and in the character and composition of the middle lamella, which account for observed changes in flavor and firmness of tissues.

Studies of the effect of soil type on the value of potato tubers for use as seed, indicated that, in general, seed tubers grown on muck soils give higher yields than do tubers from the same original stock grown on upland soil.

A large part of the results of the research work of the department during the year is summarized in the following publications, which appeared in various technical journals:

- L. W. Corbett and H. C. Thompson — Physical and chemical changes in celery during storage. *Amer. Soc. Hort. Sci. Proc.* 22. 1925.
E. V. Hardenburg — The influence of soil type on seed potatoes. *Potato news bul.* 2: 464-466. 1925.
E. V. Hardenburg — Muck and peat soils for potato production. *Amer. Peat Soc. Journ.* 19: 23-28. 1926.
H. C. Thompson — Research in vegetable gardening. *Amer. Soc. Hort. Sci. Proc.* 22. 1925.
Paul Work — Types and varieties of celery. *Amer. Soc. Hort. Sci. Proc.* 22: 333-337. 1925.

The following paper has been accepted for publication as a bulletin of the experiment station:

- H. C. Thompson — Experimental studies of cultivation of certain vegetable crops.

The following article is ready for publication:

- Paul Work — Tomato-fertilizer studies in Chautauqua County.

THE STATE EXTENSION SERVICE

A somewhat improved economic situation in agriculture is reflected in response to extension teaching. Farmers are more encouraged and are making every effort to adapt their business methods to changed conditions.

At no time, in the history of the extension service, have county programs been better planned or more consistently carried out. This signifies not only continued refinement of methods and increased efficiency on the part of employees in the service, but also, what is of equal or greater importance, a growth and development of rural leadership along sound and constructive lines. It should continue to be the aim of extension teaching to seek out this leadership which exists potentially in every community, find the stimulus to set it at work, and help to develop it in sane and forward-looking ways.

As shown in the detailed report which follows, the entire program has been carefully selected to fit present economic conditions. Campaigns

have been used to emphasize the most important features. In actual numbers of teaching contacts made by specialists in agriculture and home economics, there has been an increase of about 27 per cent as compared with the preceding fiscal year.

Administration

Farmers' Week. The nineteenth annual Farmers' Week, held February 8 to 13 inclusive, again demonstrated that the event has become an established one on the calendar of a goodly number of farm people in the State; for, in spite of adverse weather conditions, with roads impassable to automobiles, the registration amounted to 3167. This number exceeded the enrollment for 1923, but was 453 under that of 1925. Of the number registered, Tompkins County furnished 1289; Cayuga and Seneca Counties tied for second place, with 148 each; and Tioga County came next, with 137. Last year 1722 were registered from Tompkins County, and so the decrease of 433 in Tompkins County alone practically accounts for the total decrease as compared with the preceding year.

A further study of the registration shows that 1169 persons gave their occupations as farming and 779 as homemakers; and 1609 persons indicated that they had attended some previous Farmers' Week, while 214 farmers and 285 homemakers said they were attending for the first time. Of the total registration, 592 had been students in the College, 354 having been regular students and 238 special and winter-course students.

The program carried the usual variety of subject matter—lectures, demonstrations, practice periods, and exhibits. The number of exhibits was reduced somewhat, but the quality was considerably better than in previous years. The livestock-judging contest for students from high schools was unusually good, as were the poultry and egg-judging contests. Among the demonstrations, the horse-pulling contest probably attracted the most attention. A dynamometer sent by Pennsylvania State College, with Professor Vial in charge, was used, and several of the college teams were pitted against one another. As a result of the interest shown in this demonstration, a machine has been purchased for New York State which will be used at several of the county fairs this fall and will be available for Farmers' Week next year, when a more extended contest will be carried out.

Junior Field Days. Without question the Junior Field Days of 1926, held on June 23, 24, and 25, were the most successful that have thus far been conducted. The interest in this event seems to be growing, not so much in point of numbers—although 1561 were registered this year as against 1450 last year—but rather in the larger number of counties represented and a better distribution among counties. Tompkins County had the largest attendance, with 193 as against 158 last year, and Monroe was next, with 187 as against 206 last year. Several counties without junior extension agents had substantial registrations—Erie County having 29, Cortland County 17, Tioga County 10, and Orleans County 9.

Two cafeterias were used by the juniors, one in Willard Straight Hall and one in the Home Economics Building. In the latter a flat charge of twenty-five cents for breakfast, and fifty cents each for dinner and supper,

was made. At Willard Straight Hall meals were served on a cafeteria basis.

The subject-matter program was carried through without change, and in much better form than in previous years. Fewer subjects were given, longer periods were allowed, and each exercise was ready to start on time. Bringing the girls and boys together on the general subjects of health, music, and club organization, worked very well.

Junior Field Days, if they are to be continued, should become a definite project of the Colleges of Agriculture and Home Economics, if not of the University. The bringing of 1500 rural girls and boys each year to their State College, and giving them instruction, recreation, and inspiration, is of tremendous importance and should enlist the support of the entire institution. It may therefore be desirable to place the management of this event in charge of a general college committee.

Indian extension. The past year doubtless was the most successful one that the Extension Service has had among the Six Nations of Indians, especially in the growth of a community consciousness that the development and the future of their reservations depend on a successful agriculture. The accepted notion for generations was that, to be successful, an Indian had to leave his reservation. But a change is taking place, due partly to the lack of employment in the cities and partly to the fact that many of the Indians are making a good living from their farms—largely as a result of help which the Extension Service has given them. With their agricultural background of centuries, these people need only encouragement and knowledge of modern methods. They are building slowly but successfully an economic foundation that has attracted the attention of their white neighbors. More Indians have bank accounts today than ever before in the history of these people, and a plan is being worked out whereby they may gain better knowledge of business conditions and methods.

Plot and orchard demonstrations were conducted satisfactorily, and every reservation held a successful farmers' picnic. One series of meetings on all reservations gave an average attendance of 42, which will equal those of white communities. Forty-six Indian farmers attended Farmers' Week, and 71 came to Geneva and Ithaca for the annual Indian Field Days.

Fairs were held successfully on three reservations. The one at St. Regis, now in its fourth year, cleared enough funds to complete the purchase of the grounds. The new fair at Allegany started successfully. The fifty-third annual Cattaraugus Fair was truly a "Six Nations' Fair," for every reservation sent an exhibit.

Every reservation now has an organized group, and the Cornell Indian Boards have become a real force in the life of these 6500 people living on 87,000 acres of land embraced in their six reservations.

Loan of lantern slides. During the year, 420 reports were received from borrowers, indicating 778 showings before a total attendance of 35,167, as compared with 310 borrowers who reported 599 showings and 26,000 attendance for 1924-25. The records show that the College actually loaned 646 lantern-slide sets and 215 individual song slides, about the same number as were loaned last year; but the reports received were more

complete, and also indicated that the sets were shown more times by the borrowers, with larger aggregate attendance, than was the case in 1924-25.

The College now has 68 series of slides, of which 42 are held in duplicate, 6 in triplicate, and 13 in quadruplicate, making a total of 707 slides in the loan collection. Of the 68 series, 59 are accompanied by supplementary lecture notes prepared by specialists. Agricultural and other high-school teachers are the most frequent borrowers; but grange lecturers, rural pastors, county agents, and others, evidently find the service a helpful supplement to their teaching.

Considerably more use was made this year, by the extension specialists, of the gas and electric lanterns and motion-picture machines. Although no complete account was kept of the number of times these were loaned, the records show that the lanterns were taken on 88 trips and the motion-picture machines on 36.

Through special arrangements between Director C. E. Ladd and Director C. W. Warburton of the United States Department of Agriculture, county agents, home demonstration agents, and county club agents are now able to procure all federal motion-picture films and slide series direct from Washington.

Farm and home institutes. The number of farm and home institutes called for by the people during the year 1925-26 was considerably greater than in the preceding year. The number of counties asking for institutes increased from 15 to 28. The number of institutes held increased from 89 to 155, and the number of sessions from 173 to 277. The total attendance increased from 5799 to 10,558, or nearly double, the average attendance increasing from 65 to 68. The state appropriation used for institutes in 1924-25 was \$5926.06. In 1925-26 it was \$7460.02, showing a reduction in cost per institute from \$66.58 to \$48.13. The same number of speakers (26) was employed both years. The saving was due in the main to the larger number of institutes held.

Twenty-five of the institutes were held between July and November, and were known as "summer institutes." They were conducted by the adviser in institute extension, with the assistance of various members of the staff. They were placed in communities where there were few members, or, in most cases, no members, of either a farm or a home bureau, and where no other extension work was being carried on by the State. Several of the meetings were held in private houses or in one-room school-houses.

One county agricultural agent reported: "Moriah community seems to have been stirred by something. It has always been backward, but our membership is treble this year and the people are adopting new practices and show much interest at the meetings." The summer institute at Moriah was one of the best of the series, the attendance being 108.

Radio. The College has continued to furnish either manuscript, or, when convenient, a speaker, on some timely topic, once each month, for the agricultural program of WGY, Schenectady. In addition, during the winter a consecutive series of five talks on important phases of poultry husbandry was prepared by the College and read into the microphone by the station announcer. Copies of these talks were made available to persons

requesting them by letter either to the broadcasting station or to the local county agents of the College. Other subjects presented included four on marketing, three on some phase of girls' and boys' club work, and one each on tree planting, selection of fertilizers, and control of insect pests.

The number of comments or inquiries sent by farmers, resulting from the radio program, has been somewhat disappointing. Possibly the hour set by the station, seven o'clock, is too early for many farmers.

State Fair. The College took its usual part in the activities of the State Fair. Several departments made exhibits, and many members of the college staff acted as judges and superintendents in various departments of the fair.

The exhibits included one on alfalfa, emphasizing the value and uses of this plant from the viewpoint of both feeding purposes and the maintaining of soil fertility. Charts and photographs showed the effect of alfalfa on succeeding crops, also the cheapness of nitrogen from this source as compared with that from commercial fertilizers. As a companion exhibit to the one on alfalfa, the Department of Animal Husbandry showed three pairs of calves which had been fed for four months on the same grain ration, but in each pair one calf had alfalfa and the other had timothy. In each case the apparent gain in favor of alfalfa was very marked.

The Department of Poultry Husbandry exhibited six pens of chicks to show how rickets in poultry can be controlled. The several pens had received different treatments, including cod-liver oil, sunlight, and ultra-violet rays. When compared with the pen which had no treatment, marked results could be seen.

The Department of Vegetable Gardening had an exhibit illustrating the value of using vegetable seeds of known origin and quality. The Department of Plant Breeding showed several of the new recommended varieties of oats, wheat, barley, and corn adaptable to New York, and indicated sources from which seed of these varieties could be obtained.

The forestry exhibit was one of the best ever presented. It stressed the need, in the State, of wood material for fence posts and grape stakes. In addition, it gave specific instructions on how to meet immediate needs through treatment of the nondurable species, and on how to provide for the future by planting the durable species.

The "Niagara Falls" of milk, in the Dairy Building, was reconstructed and moved to the pit which was formerly used for demonstrations. The Department of Dairy Industry of the College was largely responsible for this exhibit. In addition to the "falls," an exhibit showing several methods of cooling milk was placed in the center of the building.

Town and county fairs. The policy of furnishing judges to county associations that show willingness to accept the recommendations of the College for premium-list revision and to handle the judging as an educational demonstration, has been continued. During the fall of 1925, judges were furnished to 44 fairs in 39 counties, totaling 122 man days. Also, in one county the College set up an exhibit of ornamental planting plans for farm homesteads, which proved very attractive.

Extension schools. The popular type of meeting known as the extension school has undergone considerable modification in recent years.

At present the one-day school far outnumbers the longer ones, and, for convenience in keeping records, these shorter schools are classified under another heading. Of the longer schools there were 5 of two days duration, 16 of three days, and 5 of five days. These were held in 13 counties, with an average enrollment of 32.5.

Lectures and demonstrations. Exclusive of farm and home institutes, the college specialists in agriculture assisted county agents or responded to calls from granges, schools, churches, chambers of commerce, rotary clubs, and many other organizations, in presenting 2568 lectures and 2075 demonstrations, attended by 215,676 persons. To this total should be added 474 lectures and 157 demonstrations in home economics, attended by 27,135 persons; and 106,931 persons addressed in 2489 meetings attended by administrative officers. These totals, together with the schools, institutes, and other meetings, give a grand total of 381,273 teaching contacts for the year. Distribution of these teaching contacts by subject matter is set forth in the tabulation on page 37.

The extension-methods handbook

Research in extension has been carried on to discover those teaching means that have proved most successful, to improve old methods, to devise new ones, and finally to bring these findings to the attention of extension specialists, county agents, administrative officers, and volunteer local leaders. To this end an extension-methods handbook has been in course of preparation. This task was completed during the year and copies were distributed. With frequent timely revisions and additions, this record of accumulated experience and systematic study of teaching methods as applied to adults will undoubtedly prove a most valuable guide.

Farm bureaus

The farm-bureau associations are composed mainly of the more progressive farmers of the various counties. These men maintain the local organizations to foster the improvement of agriculture, and they contribute liberally of their time and money for that purpose. Besides paying the expenses of their associations, they contributed during 1925, from their private funds, an average of \$1703.45 per county toward financing the educational program of the bureaus. Further financial assistance for this purpose was provided by county appropriations averaging \$3948.71, making a total of \$310,869.08 provided by the fifty-five counties to supplement the state and federal funds available for farm bureaus. This voluntary participation of farmers is proving of great value to the work. Every year sees more farmers making use of the services and information available through the county agent, and adopting more of the practices advocated.

During the calendar year 1925, county agents spent the greater part of their time in close contact with the everyday problems of the farm. They made 48,262 visits to farms, received 60,070 business calls at their offices, answered a much larger number of telephone calls for information and service, and wrote 104,880 personal letters. Through these contacts and by other means, 8021 farmers were helped in securing better seed selec-

SUMMARY OF EXTENSION SPECIALISTS' FIELD ACTIVITIES FROM JULY 1, 1925, TO JUNE 30, 1926

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Number of farm and home visits	Conferences		Lectures		Miscellaneous (number of days)	Number of teaching contacts
		Number	Attendance	Number	Attendance	Number	Attendance		Number	Attendance	Number	Attendance		
Agricultural Economics.....	396	29	823	46	313	.....	.....	180	31	442	255	13,690	79	15,450
Agroonomy.....	495	.....	.....	19	473	.....	.....	1,806	52	579	397	9,956	31	12,814
.....	591	187	17,240	17	638	.....	.....	605	69	459	518	31,132	62	40,134
.....	196	14	50	.....	.....	1	2	166	79	498	45	6,431	84	7,147
.....	277	49	518	7	211	7	135	308	137	803	97	14,476	12	16,451
Total Hort.														
.....	140	23	1,141	22	631	.....	.....	100	79	311	122	9,061	7	11,244
.....	179	6	109	.....	.....	1	25	382	59	407	51	4,628	23	5,551
.....	203	5	131	5	98	.....	.....	485	24	162	6	277	43	1,153
.....	181	81	1,856	.....	.....	.....	.....	313	92	277	49	1,780	9	4,266
.....	185	87	1,282	20	243	2	55	289	170	627	98	6,856	6	9,352
.....	636	381	7,963	10	519	.....	.....	517	37	725	385	17,097	80	26,821
.....	11	1	30	.....	.....	.....	.....	.....	1	13	12	1,801	.....	1,846
.....	569	975	16,662	2	6	6	138	233	15	252	11	310	50	27,681
.....	213	41	4,636	23	2,768	265	6,133	2	68	1,263	62	4,827	10	19,049
.....	334	35	2,572	18	1,661	9	103	179	67	675	437	37,921	48	43,171
.....	19	.....	.....	.....	.....	.....	.....	2	2	18	23	2,857	.....	2,877
Total agriculture.....	4,619	1,584	55,015	192	7,561	291	6,671	5,687	952	7,513	2,568	133,100	543	235,547
Home Economics.....	977	141	8,200	16	183	575	8,665	193	823	2,802	474	18,746	20	38,795
Total specialists.....	5,596	2,025	63,221	207	7,744	866	15,336	5,880	1,805	10,315	3,042	171,846	563	274,342
Total administration.....	1,353	.....	.....	.....	.....	213	6,883	.....	1,702	11,030	574	85,998	75	106,931
Grand total.....	6,948	2,025	63,221	207	7,744	1,079	22,219	5,880	3,507	21,365	3,616	260,844	637	381,273

tion and testing; 2881 farmers were started in using legume inoculation for the first time, and advice and assistance was given on that subject to thousands of others; 2883 farmers adopted better methods of growing potatoes; 5385 farmers followed the directions of the county agents in the use of fertilizers and lime, and in otherwise maintaining soil fertility; 5018 farmers were helped in matters pertaining to planting and the care of fruit; 1226 farmers were helped to adopt new practices in the care of woodlots, including the planting of unused lands to forests; and 2411 farmers participated in the woodchuck-control campaign.

In the work with livestock, also, the results were impressive. The records show that 1898 farmers have introduced purebred livestock on their farms, 2635 farmers were given help in culling out poor stock, 16,874 farmers culled from their poultry flocks 704,817 unproductive hens, 37 cow-testing associations were organized, and 5780 farmers were given definite personal help in problems concerning the sanitary production and care of milk. Altogether, 44,615 farmers adopted new practices in livestock and poultry keeping. In farm engineering, 1547 farmers were helped to drain fields, install water, sewage, and lighting systems, build or remodel buildings, and make other improvements; and in farm management, 2168 farmers were helped to adopt better practices. Harvest weather forecasts have been made of greater value to farmers, and have been made available to practically all farmers in the State during haying and harvest seasons.

In addition to all of this, the agents have kept the farmers of their counties in touch with the important farm movements, have warned them of the appearance of injurious pests, and, through the local press, the "Farm Bureau News," and countless circulars, have sent out continuously the best up-to-date authentic information concerning the seasonal problems that confront every farmer in his work.

These are some of the results of the work of one year. There are also numerous fine examples of the cumulative effect of these educational programs carried on systematically over a series of years. Four years ago the farm bureaus started a campaign of reforestation, in cooperation with the State Conservation Commission. At that time only a few scattered plantings were being made by farmers. Since then, more than 1200 demonstration forests have been planted under the direction of the county agents, and these are so located that nearly every farmer in the State may see the method used and watch the development of the trees. About 5,000,000 trees were planted by farmers last year.

Using these demonstrations as a basis for extensive work in reforestation, the farm bureau in Otsego County conducted a campaign during the spring to induce large numbers of farmers to plant trees. With the active cooperation of banks, schools, sportsmen's clubs, granges, and the county board of supervisors, more than 600,000 trees were planted in that one county this year.

When the farm-bureau work began in Herkimer County, there were in that county only 13 acres producing alfalfa successfully. Due to consistent work of the bureau over a period of eleven years, there are now

more than 1500 acres in alfalfa. The farmers of that region have learned how to grow alfalfa under their conditions. This alone is worth more than the entire cost of all the farm-bureau work in that county.

In all counties growing fruit intensively, a very thorough spray service has been developed. Through it, growers are informed daily of the development of pests, the exact time to spray, and the materials to use. This information is based on the best expert knowledge available in the industry.

One of the vital issues before dairymen is the campaign to eradicate tuberculosis among dairy cattle. County agents have carried authentic information on this subject into nearly every farm community in the State, by means of meetings and thousands of visits to herd owners.

Junior extension

Interest in junior-extension work continued to increase during the year, as is evidenced by (1) three new counties, Schuyler, Dutchess, and Albany, making appropriations for junior extension; (2) an increase in enrollment from 15,645 to 16,815; (3) an increase in the total appropriation by boards of supervisors from \$50,675 to \$59,200. Cooperative relations in junior-extension work with the State School of Agriculture at Cobleskill were terminated during the year by mutual consent.

New legislation (Chapter 505, Laws of 1926) made some changes necessary for continued cooperation with the State Department of Education. A memorandum agreement between the College and the Department has been prepared, which supersedes all previous memoranda on this question but which does not essentially change the policies that have previously governed this cooperative effort.

Considerable progress has been made in making the 4-H clubs active throughout the year, and using them to contribute to the social as well as the economic and educational interests of the club members. A total of 1745 organized clubs was reported by extension agents.

4-H club members from New York participated in three interstate club activities during the year, as follows: Madison Square Garden Poultry Show and Judging Contest; National Dairy Show; Eastern States Exposition.

The annual Junior Field Days were held at the College June 23 to 25, with a total attendance of 1561.

The following changes in personnel occurred during the year: C. E. Storrs, of Genesee County, resigned and was replaced by J. D. Walker; W. G. Meal resigned in Tompkins County, and was succeeded by E. W. Hoffman; R. L. McNitt resigned in Wyoming County, and was succeeded by A. A. McKenzie.

State Club Leader W. J. Wright was absent on sabbatic leave from November 1, 1925, to April 30, 1926, making a special study of extension work for the United States Department of Agriculture.

The following tables show the enrollment by counties and by projects:

ENROLLMENT AND COMPLETION OF CLUB WORK IN THE VARIOUS ORGANIZED COUNTIES
IN 1925

County	Number enrolled	Number completing work
Allegany-Steuben	585	402
Chemung	1,006	788
Chenango	1,221	1,022
Delaware	801	644
Dutchess	452	294
Genesee	776	355
Jefferson	1,349	1,064
Livingston	651	416
Madison	235	195
Monroe	707	557
Nassau	610	366
Oneida	576	438
Onondaga	763	469
Ontario	704	545
Orange	700	431
Oswego	830	613
Otsego	908	658
Rensselaer	324	285
Schoharie	98	85
Schuyler	236	187
Tioga	173	....
Tompkins	493	177
Wyoming	595	396
Total in organized counties	14,793	10,387
Total in unorganized counties.....	2,022	1,358
Total for State.....	16,815	11,745

ENROLLMENT AND COMPLETION OF CLUB WORK BY PROJECTS IN 1925

Project	Number enrolled	Number completing work
Corn	205	146
Beans	128	93
Potatoes	1,857	1,401
Gardens	3,279	2,321
Home groups*.....	48	36
Forestry	19	19
Dairy cattle	840	617
Swine	182	123
Sheep	160	113
Poultry	2,985	2,081
Farm shop	258	137
Farm accounts	1	1
Handicraft*	76	60
Beekeeping*	6	4
Rabbits	38	22
Cow testing	19	15
Food preparation	1,612	1,186
Food preservation	625	329
Clothing	4,398	3,006
Girl's room	79	35
Total for State	16,815	11,745

* Not a regularly organized project.

Office of Publication

The personnel of the Office of Publication has continued unchanged except for the resignation of Assistant Professor H. A. Stevenson and that of David Seaver Cook. Mr. Stevenson resigned to accept a position with the Macmillan Company, of New York. He was succeeded as supervisor of the farm study courses by George S. Butts, a recent graduate of Cornell. Mr. Cook was forced to seek a change of occupation because of the condition of his eyes. He was succeeded at the end of the fiscal year by Leland Peter Ham, a graduate of the College of Agriculture in the class of 1926.

During the year, 1875 separate items were released by the college news service, as compared with 1603 in 1925. From these, 61,301 printings were seen in press clippings as compared with 57,256 in the preceding year. The total circulation represented by these printings was 199,055,852 as against 192,295,885 for 1924-25. The largest single month was February, according to the clippings; May had the lead in the two preceding years.

The news-writing schools for country correspondents of local community weeklies, and for home-bureau and farm-bureau news reports, have been continued and have improved in both attendance and effectiveness. These schools will probably be maintained until all parts of the State have been covered. It is significant that recent requests for the schools have come from newspapers, though earlier requests emanated from home bureaus and farm bureaus wishing to improve the news writing for publicity purposes.

A total of 1,362,789 publications were distributed in 1925-26, as compared with 1,144,576 in 1924-25 and 1,350,463 in 1923-24. Requests received through the mail for publications numbered 56,040 for the year, as against 62,823 in the preceding year; but 406,982 bulletins were distributed in response to these requests, whereas in the preceding year 380,950 were distributed to the larger number of requests.

A new plan for distribution, whereby a query card is sent to all persons who wish to receive technical publications, either experiment-station bulletins or memoirs, has proved satisfactory. It has reduced the total numbers of bulletins mailed from what it would have been with the growing lists, and has decreased the distribution to persons who are not interested in the subjects covered.

Increase in effectiveness is noted in the editing of publications, and the work in this office is practically current in spite of an increase in the amount of material which has been handled. During the past three years the increase in work in this office is indicated by the following figures: in the fiscal year ending June 30, 1924, 77 publications containing 3176 pages were edited; in 1924-25 the editors handled 105 publications with 3842 printed pages; in 1925-26 the editorial output amounted to 108 publications with 4467 pages. In addition, a large amount of editorial work is done on periodicals such as the *Extension Service News*, the *Service Sheet*, and various other forms of printed matter.

During the year 1925-26 the farm study courses were continued under the same policy which has prevailed for several years. A total of 1799

students was reached during the year, as compared with 1388 in 1924-25. However, personal service to each student rather than a high enrollment figure continues to be the aim of the office. The courses in poultry husbandry, vegetable gardening, farm management, and milk production were revised. The first two were divided into four shorter courses each, and the latter two into three courses each. The Department of Farm Management added a course in farm records and accounts, one in agricultural prices, and one in cooperative marketing; and the Department of Vegetable Gardening added a course in home gardening. These provide, all together, a wider and more satisfactory selection than was available heretofore. It has seemed highly desirable to have each course of such a length that it can be easily completed during the winter months.

The Office of Publication cooperated with the Department of Rural Education in handling the records of a correspondence course in the

SUMMARY OF CORNELL FARM STUDY COURSES FOR 1925-26

Subject	Reports		Enrollments				Number of completions	Practices reported changed		
	Number received	Average number per month	Number on July 1, 1925	New	Total	Number on June 30, 1926		Number of members reporting	Number of practices	Average number per report
Farm management.....	610	50.8	73	....	73	31	9	6	20	3.3
Milk production.....	208	17.3	44	....	44	12	9	5	20	4.0
Poultry husbandry.....	936	78.0	200	5	205	43	18	15	59	3.9
Vegetable gardening....	272	22.7	29	4	33	15	1	1	1	1.0
Agricultural prices*....	3	0.6	....	2	2	2	....	....	....	....
Beekkeeping.....	165	13.7	18	25	43	24	9	4	13	3.2
Chick rearing*.....	280	46.6	....	118	118	112	1	....	....	....
Cooperative marketing*	21	3.0	....	26	26	21	....	....	....	....
Dairy-herd improvement*.....	21	3.0	....	5	5	5	....	....	....	....
Elementary farm management*.....	356	50.8	....	65	65	50	4	4	4	1.0
Farm accounting*.....	5	1.0	....	2	2	2	....	....	....	....
Farm mechanics.....	29	2.4	25	23	48	17	3	1	4	4.0
Feeding and management of dairy cows*.	263	37.5	....	58	58	52	2	1	4	4.0
Market gardening*.....	109	18.1	....	32	32	29	....	....	....	....
Home gardening*.....	39	6.5	....	17	17	16	....	....	....	....
Marketing of poultry products*.....	9	1.8	....	3	3	3	....	....	....	....
Muck crops*.....	1	0.2	....	3	3	3	....	....	....	....
Orchard fruits.....	330	27.5	36	35	71	36	3	3	11	3.7
Pork production.....	51	4.2	5	7	12	7	2	2	1	0.5
Poultry breeding and incubation*.....	31	5.1	....	21	21	19	....	....	....	....
Poultry flock management*.....	948	135.4	....	192	192	149	....	....	....	....
Rearing calves and heifers*.....	27	3.8	....	5	5	4	....	....	....	....
Sheep and wool.....	352	29.3	44	32	76	37	10	10	27	2.7
Small fruits.....	194	16.2	11	21	32	12	1	1	4	4.0
Truck crops*.....	4	0.5	....	4	4	3	....	....	....	....
Vegetable forcing.....	23	1.9	3	3	6	1	1	1	4	4.0
Farm mechanics, junior project.....	3,237	269.7	109	485	594	162	290	....	....	....
Principles of school supervision*.....	65	16.5	....	9	9	....	7	....	....	....
Total.....	8,589	715.7	597	1,202	1,799	867	370	54	172	3.2

* The courses marked with an asterisk have not yet run for a full year.

principles of school supervision, which was taken by nine district superintendents. The Department of Rural Engineering has prepared, as a second-year project, a course in junior woodworking for those boys who have completed the farm-shop project. The woodworking course will be handled through this office in the same manner as has the junior farm-mechanics course for the past two years.

At a meeting of the specialists from each department giving courses, it became apparent that the future growth and development of the Cornell farm study courses have two main limiting factors: first, the amount of time that can be devoted to the courses by the specialists in each department; and secondly, the limited choice of textbooks suitable for correspondence teaching. The amount of time which can be spent on the courses by specialists is largely a matter of intra-departmental organization, and the policy in regard to restricting textbooks must be governed accordingly. Suitable textbooks cannot be produced at a moment's notice, but, if sufficient demand can be shown to exist for such texts, they will doubtless be forthcoming in the near future.

A report of the courses for the year 1925-26 is given in the table on page 42.

Publications issued. The following tabular summary gives the lists of the various publications issued during the year, together with the number of pages and the number of copies printed for each one.

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
92 The flora of the Cayuga Lake Basin, New York (Botany)	491	5,000
93 A study of the oyster-shell scale, <i>Lepidosaphes ulmi</i> (L.), and one of its parasites, <i>Aphelinus mytilaspidis</i> Le B. (Entomology)	67	3,500
94 Variations within and between morphological varieties of oats and barley (Plant Breeding)	35	3,500
95 An explanation for the relative effects of timothy and clover residues in the soil on nitrate depression (Agronomy)	21	4,500
96 Interspecific transmission of mosaic diseases of plants (Plant Pathology)	34	4,500
97 Calcium sulfate as a soil amendment (Agronomy)	51	4,500
98 The collection and utilization of pollen by the honeybee (Entomology)	55	4,500
99 The nitrogen and carbohydrate composition of the develop- ing flowers and young fruits of the apple (Pomology).	79	3,500
Total	833	33,500
EXPERIMENT-STATION BULLETINS:		
283 (Revised reprint) The control of insect pests and plant diseases (Entomology, Plant Pathology)	48	5,000
429 (Revised reprint) The control of bacterial blight of celery by spraying and dusting (Plant Pathology)	30	4,000
441 Economic studies of dairy farming in New York. IV. Grade B milk with cash crops and mixed hay roughage, crop year 1921 (Agricultural Economics and Farm Management)	76	6,000
442 Economic studies of dairy farming in New York. V. Cheese-factory milk (Agricultural Economics and Farm Management)	50	6,000

		Number of pages in printed publication	Number of copies printed
443	The marketing of cabbage (Agricultural Economics and Farm Management)	137	6,000
444	The climate of New York State (Meteorology).....	38	7,500
445	A preliminary survey of milk marketing in New York (Agricultural Economics and Farm Management)....	51	6,000
446	Index numbers of freight rates and their relation to agricultural prices and production (Agricultural Economics and Farm Management).....	37	6,000
447	The effect of some legumes on the yields of succeeding crops (Agronomy)	20	6,000
448	Root and crown injury of apple trees (Plant Pathology)..	9	6,000
449	Biology and control of the white-pine weevil, <i>Pissodes strobi</i> Peck (Entomology).....	32	6,000
450	Results of sweet-corn suckering experiments (Vegetable Gardening)	15	6,000
Total		543	70,500
READING-COURSE LESSONS FOR THE FARM:			
117	(Reprint) Computing rations for farm animals (Animal Husbandry)	69	3,000
119	(Reprint) The curing of meat and meat products on the farm (Animal Husbandry)	15	5,000
121	(Revised reprint) The culture of garden roses (Floriculture and Ornamental Horticulture)	24	5,000
133	(Reprint) Preparation of eggs for market (Poultry Husbandry)	44	5,000
139	(Reprint) Swine production in New York (Animal Husbandry)	31	5,000
151	(Reprint) Growing sweet peas (Floriculture and Ornamental Horticulture)	29	5,000
152	(Reprint) China asters (Floriculture and Ornamental Horticulture)	33	3,000
154	(Reprint) The peony, a flower for the farmer (Floriculture and Ornamental Horticulture).....	41	5,000
157	(Reprint) Feeding for egg production (Poultry Husbandry)	44	10,000
160	(Reprint) Harness repairing (Rural Engineering).....	43	5,000
Total		373	51,000
READING-COURSE LESSONS FOR THE HOME:			
85	(Revised reprint) The arrangement of household furnishings (Home Economics).....	12	5,000
108	(Reprint) Planning the home kitchen (Home Economics)	19	5,000
114	(Reprint) Principles of jelly making (Home Economics)	16	5,000
126	(Reprint) How to keep a cash account (Home Economics)	8	5,000
133	(Reprint) Use more cheese (Home Economics).....	18	8,000
134	(Revised reprint) Household insects and their control (Entomology)	40	5,000
135	(Reprint) Fireless and steam-pressure cookers (Home Economics)	43	10,000
136	(Reprint) Food preservation (Home Economics).....	86	10,000
138	(Reprint) Saving strength in the household (Home Economics)	20	5,000
Total		262	58,000

	Number of pages in printed publication	Number of copies printed
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EXTENSION BULLETINS:

9	(Reprint) Gladiolus studies. I. Botany, history, and evolution of the gladiolus (Floriculture and Ornamental Horticulture)	100	2,000
35	(Revised reprint) Composition of feeds (Animal Husbandry)	2	2,000
47	(Revised reprint) List of publications for general distribution (Extension Service).....	12	106,000
48	(Revised reprint) Sewage disposal for rural homes (Rural Engineering)	25	8,000
50	(Reprint) The farm water supply. Part I. Simple water systems and plumbing (Rural Engineering).....	75	5,000
52	(Reprint) Improving the school-building facilities of one- and two-teacher districts thru measurement (Rural Education)	16	5,000
55	(Reprint) How to plan the farm layout (Agricultural Economics and Farm Management).....	36	5,000
57	(Reprint) Soldering (Rural Engineering).....	27	5,000
64	(Revised reprint) Raspberries, blackberries, and dewberries (Pomology)	12	5,000
66	(Reprint) Peach culture in New York (Pomology).....	34	5,000
67	(Reprint) The flower garden (Floriculture and Ornamental Horticulture)	42	3,000
70	(Revised reprint) Food-selection score card (Home Economics)	4	30,000
71	(Revised reprint) Food-value chart (Home Economics)..	4	25,000
74	(Reprint) The family garden (Vegetable Gardening).....	34	3,000
75	(Reprint) The planting and the early care of the commercial apple orchard (Pomology)	43	10,000
81	(Reprint) Culture of asparagus (Vegetable Gardening)..	12	4,000
82	(Reprint) Play production for the country theatre (Rural Social Organization)	78	3,000
83	(Reprint) Some results of dairy improvement associations (Animal Husbandry)	19	5,000
84	(Revised reprint) Alfalfa production for New York (Agronomy)	25	8,000
85	(Reprint) The gas engine on the farm (Rural Engineering)	52	10,000
94	(Reprint) Fitting the farm saws (Rural Engineering)...	36	10,000
95	(Reprint) Growing peas for the canning factory (Vegetable Gardening)	24	5,000
96	(Revised reprint) Growing tomatoes for the canning factory (Vegetable Gardening)	23	5,000
97	(Reprint) Growing sweet corn for the canning factory (Vegetable Gardening)	17	5,000
98	(Reprint) The production and marketing of field beans (Vegetable Gardening)	29	5,000
102	(Reprint) Electric washing machines (Home Economics)..	11	5,000
103	(Reprint) Portable electric vacuum cleaners (Home Economics)	8	5,000
105	(Reprint) Milk as a daily food (Home Economics).....	35	10,000
117	(Reprint) A system of pedigree hatching and record keeping for poultry (Poultry Husbandry).....	29	5,000
119	(Reprint) Health and personal appearance (Home Economics)	23	10,000
127	Simplifying home sewing (Home Economics).....	28	15,000
128	Storage scald of apples (Pomology).....	10	5,000
129	Practical examples in dairy arithmetic (Dairy Industry)..	27	5,000

	Number of pages in printed publication	Number of copies printed
130 The mineral nutrition of farm animals (Animal Husbandry)	24	8,000
131 The separation of cream on the farm (Dairy Industry) ..	22	5,000
132 How to make and use a balance sheet (Agricultural Economics and Farm Management)	30	5,000
133 The gas engine on the farm, II: Starting troubles and their remedy (Rural Engineering)	60	10,000
134 The clovers in New York (Agronomy)	23	8,000
135 Potato diseases and their control (Plant Pathology)	123	10,000
136 Seeding, fertilization, and management of meadows (Agronomy)	20	5,000
137 Bang abortion disease in cattle (New York State Veterinary College)	20	10,000
138 The gummed-paper dress form: making, altering, covering, and mounting (Home Economics)	27	10,000
139 Plans of Cornell poultry houses and appliances (Poultry Husbandry)	36	10,000
140 The construction of concrete floors for dairy stables (Rural Engineering)	52	10,000
141 Potatoes in New York: production, storage, and marketing (Vegetable Gardening)	35	10,000
142 Suggestions for making cakes (Home Economics)	7	10,000
143 Capon production (Poultry Husbandry)	16	5,000
144 Artistry in dress (Home Economics)	67	10,000
145 The farm water supply. Part II. The use of the hydraulic ram (Rural Engineering)	28	5,000
146 Fitting and using the dress form (Home Economics)	50	7,500
147 The gas engine on the farm, III: Running troubles and their remedy (Rural Engineering)	48	10,000
Total	<u>1,640</u>	<u>487,500</u>
JUNIOR EXTENSION BULLETINS:		
14 Making a tool and nail box (Rural Engineering)	31	8,500
15 Clothing project programs (Home Economics)	36	10,000
16 The 4-H club homemaking programs—a manual of requirements for members and leaders (Home Economics)	11	30,000
Total	<u>78</u>	<u>48,500</u>
RURAL SCHOOL LEAFLETS:		
September, 1925 (Rural Education)	140	25,000
November, 1925 (Rural Education)	44	150,000
January, 1926 (Rural Education)	50	150,000
March, 1926 (Rural Education)	44	150,000
Total	<u>278</u>	<u>475,000</u>
MISCELLANEOUS:		
(Reprint) How to keep a cash account on a farm (Agricultural Economics and Farm Management)	36	5,000
(Revised reprint) How to keep a poultry account (Agricultural Economics and Farm Management)	24	5,000
(Revised reprint) How to keep an account with dairy cows (Agricultural Economics and Farm Management)	23	5,000
(Revised reprint) How to take a farm inventory and make a credit statement (Agricultural Economics and Farm Management)	22	10,000

	Number of pages in printed publication	Number of copies printed
Program of the nineteenth annual Farmers' Week, 1926.....	32	12,000
(Revised reprint) Notes for the guidance of authors.....	8	1,000
Total	145	38,000
ANNUAL REPORT for 1925.....	87	3,800
ANNOUNCEMENTS:		
Announcement of the New York State College of Agriculture, 1925-26	72	12,000
Announcement of the New York State College of Home Eco- nomics, 1925-26	40	6,000
Announcement of the New York State College of Agriculture, 1926-27	76	12,000
Announcement of the New York State College of Home Economics, 1926-27	40	6,000
Total	228	36,000

	Total number*	Total pages	Copies
Memoirs	8	833	33,500
Experiment-station bulletins.....	12	543	70,500
Reading-course lessons for the farm.....	10	373	51,000
Reading-course lessons for the home.....	9	262	58,000
Extension bulletins	51	1,640	487,500
Junior extension bulletins.....	3	78	48,500
Rural school leaflets.....	4	278	475,000
Miscellaneous	6	145	38,000
Annual report	1	87	3,800
Announcements	4	228	36,000
Total	108	4,467	1,301,800

* Including reprints.

Agricultural Economics and Farm Management

During the year 1925-26, members of the Department of Agricultural Economics and Farm Management conducted, alone or in cooperation with other departments, eight extension schools having a total attendance of 902, and gave 330 lectures and demonstrations with a total attendance of 14,828. The lectures were given at farm-bureau community meetings, extension schools, farmers' institutes, rotary clubs, business men's clubs, and grange meetings. The principal subjects discussed at these meetings were: prices of farm products; adjusting farming to meet the present and the probable future price conditions; some problems in milk marketing; some principles of successful cooperation; how to study the financial statements of cooperative associations; marketing New York State products; how to take a farm inventory and make a credit statement; why some farms pay better than others; farm credit. Of these

subjects, the first three seemed to be of the greatest interest among farmers.

Members of the staff held 31 conferences with officers or committeemen of local farm bureaus, agricultural teachers, officers and members of marketing associations, representatives of state and county bankers' associations, and other agricultural organizations.

The enrollment in correspondence courses has averaged 102 during the past year. The present enrollment is 106. The original course in farm management has been discontinued and the following courses are now offered:

Farm Management I. An elementary course in farm management, consisting of fifteen lessons which cover some of the basic principles of the subject.

Farm Management II. (Prerequisite, course I.) A course of fifteen lessons on farm organization, covering the major factors underlying the successful organization and operation of farm businesses.

Farm Management III. (Prerequisite, courses I and II.) A course of fifteen lessons, in which detailed studies of some successful farm businesses are made.

Marketing I. A course of fifteen lessons on cooperative marketing.

Farm Management IV. A course of twelve lessons on farm inventories, farm cash accounts, crop accounts, dairy accounts, poultry accounts, labor accounts, and complete sets of farm accounts.

Farm Management V. A course of ten lessons consisting of an intensive study of agricultural prices.

The farm-management service described in the report for 1924-25 was continued, the service being extended to farmers in Albany, Cayuga, Livingston, Madison, Oneida, Onondaga, Steuben, Wayne, and Wyoming Counties.

Ten farm-management tours were held during the summer of 1925. The tours planned for 1926 include eighteen counties.

Six folding-cabinet exhibits presenting suggestions for better farm business methods were prepared for use in encouraging farmers to take annual inventories and use bank credit instead of store credit. These exhibits were lent to county agricultural agents for use in exhibits at town and county fairs during the summer. During the fall and winter, they were lent to country banks and farm bureaus for use in inventory and credit-statement campaigns.

At the request of the marketing committee of the New York State Farm Bureau Federation, a monthly summary of recent information on marketing and crop conditions, and of the results of recent research work, is prepared by the department. The "Market Basket," as this is called, is run as a special section in the *Farm Bureau News* of the various counties.

Cooperative cost accounting has been conducted on the same basis as in former years. During the year, complete sets of cost accounts were closed on 35 farms. Summaries and analyses of the accounts were used in extension teaching, and also were placed in the *Extension Service Handbook*.

The following farm-account books were furnished free to farmers in the State who agreed to use them: "How to Take a Farm Inventory and Make a Credit Statement"; "How to Keep a Poultry Account"; "How to Keep a Cash Account on a Farm"; "How to Keep an Account with a Crop"; "How to Keep an Account with Dairy Cows."

Single-enterprise crop accounts which were started last year in Yates County, were closed and summarized. Each farmer keeping an account was furnished with an analysis of his own account, and with data for comparing his crop with averages from other farms.

Campaigns for better farm credit were conducted in Madison and Otsego Counties in late November and early December. Each campaign was started with banker-farmer dinners and conferences, at which bankers, farmers, and merchants discussed their common credit problems. These conferences were followed by intensive campaigns of inventory meetings. One barn meeting, at which an actual inventory was taken, was held in every community in the two counties. In Madison County 76 farmers, and in Otsego County 65 farmers, signed an agreement to take an inventory of their farm business and to file a credit statement at a bank.

Two banker-farmer-merchant conferences were held in Oswego County in the spring of 1926. At these conferences plans were made for an intensive farm-inventory campaign to be conducted in the fall and early winter of 1926.

In December, 1925, personal letters were written to officers of all banks in the State that had in the preceding year used the farm-inventory-and-credit-statement blanks prepared by this department. In these letters reference was made to the previous use of farm-inventory and credit statements by the banks, and attention was called to the availability of inventory blanks at the College or the local farm bureaus. Sample copies of "How to Take a Farm Inventory and Make a Credit Statement" and "How to Keep a Cash Account on a Farm" were mailed to the banks at the same time that the personal letters were sent out. Similar circular letters and copies of the two account books were mailed to all other banks in the State that do business with farmers. As a result of these letters, bank officials requested 3699 copies of "How to Take a Farm Inventory and Make a Credit Statement," and 3674 copies of "How to Keep a Cash Account on a Farm," for use by their customers. Since cooperating banks have been told repeatedly that farm-account books are to be given only to farmers who request them, it would appear that an appreciable proportion of the farmers in the State have taken an inventory as a result of the work done by cooperating banks.

Many letters are received each year from farmers asking how they can reorganize their farm business so as to make more money. As a result of these requests, a farm-business service is now offered to a limited number of farmers. The service was offered on the following cooperative basis: (1) Four farmers interested in the project are selected and the project is explained to them. (2) The \$2 fee is collected in advance. (3) Records are kept and sent in to the College. The farmer agrees to (1) pay a \$2 fee; (2) take an inventory at the beginning of the year; (3) file a credit statement with a bank; (4) keep a simple record of cash farm receipts and expenses; (5) take an inventory at the end of the year. The College agrees to (1) furnish necessary inventory and cash-account books; (2) summarize the farmer's inventory at the beginning of the year and figure up his net worth; (3) summarize the farmer's cash ac-

count at the end of the year; (4) summarize the farmer's inventory at the end of the year and figure his net worth; (5) figure the labor income on the farm; (6) make a careful study of the farm business and make recommendations for improving the business. This service is limited to four farmers in each county. If any county does not take its full number, its quota will be given to other counties in order of their application.

Agronomy

In the Department of Agronomy, emphasis has been placed on the alfalfa-clover campaign throughout the year. This intensive work to further the more efficient production of these two legumes has been continued in the counties of Monroe, Orleans, Livingston, and Seneca, and has been started in the four additional counties of Schuyler, Wayne, Onondaga, and Steuben. As a result of the campaign in these eight organized counties, 1500 farms have been visited by specialists, the soil sampled, and detailed specifications for the successful production of either alfalfa or clover given in writing. About 10,000 acres have been seeded to these legumes according to specifications furnished by the extension specialists.

As in past years, hundreds of farmers have been given personal assistance with their lime and fertilizer problems. Economy in the purchase and use of lime and fertilizer has been emphasized, and specifications have been given for the conservation and utilization of the farm-manure supply.

Considerable attention has been given to furthering the program of efficient pasture management. Treatments for permanent pastures have been advocated where conditions would justify the expense, and in sections where the soil was found adapted to sweet clover this legume has been recommended for rotation pastures. The production of mixed grains, particularly oats, peas, and barley, has been advocated instead of oats alone, as a means of producing not only more grain to the acre but also a better quality for feeding to farm animals. Information has been furnished also, and some personal assistance rendered, in the production of substitute hay crops, such as oats, soybeans, and millets.

The normal number of lectures has been given at farmers' institutes, community meetings, and extension schools. There have been held, during the year, 397 such meetings with a total attendance of 9956. In addition to the regular winter meetings, nineteen field-demonstration meetings were held in the summer of 1925, at which there was a total attendance of 473 farmers.

The extension specialists devoted a total of 495 days to field work. In addition to the winter meetings, 1806 farms were visited.

The department made a very creditable exhibit at the State Fair in 1925. The exhibit was planned to further the effectiveness of the alfalfa-clover campaign, and emphasized the feeding value of these legumes as well as their value in soil improvement.

Three departmental leaflets have been prepared during the year, on the following subjects: acid phosphate; alfalfa; clover. In addition to these, 135 news articles totaling 250 pages have been prepared for publication in the papers of the State.

In connection with the various phases of the agronomy program, 3500 personal letters have been written. Most of these were addressed to New York farmers in response to requests for information on their soil and crop problems. Also, there have been prepared and mailed to the county agents 12 circular letters containing timely information on certain phases of the program. As part of the office work of the year, 1657 soil samples were examined and the results reported to the farmers of the State.

During the year personal service was given in 34 counties of the State. All of the agricultural counties were reached either through publications or by personal letters.

Animal Husbandry

The extension work of the Department of Animal Husbandry is regularly carried on by six specialists. In times of emergency and during the period when county fairs make heavy demands for judges, resident instructors are drawn on for service. The division of work remains as reported last year: dairy production two specialists, dairy-improvement associations and cow-culling clubs one specialist, sheep and wool production one specialist, livestock sanitation one specialist, club work one specialist.

Cooperation with the New York State Veterinary College during the past year made it possible to give service to two communities reporting losses of animals. Hog cholera, which is of rare occurrence in New York, was dealt with in one case, and losses of young lambs from "stiffness," or paralysis, in another. The latter disease is not yet thoroughly understood and will receive closer observation during the spring of 1927.

In a State such as New York, where the several communities have had time to work out a system of livestock husbandry roughly adapted to their needs, few changes in a program of service from year to year can be made except in cases of emergency. Therefore the programs that are used lay emphasis on desired changes in practice to keep abreast of economic demands. Because of the slowness with which certain changes are made, several subprojects will always have a prominent place in any comprehensive program. In 1925-26 the following subprojects were offered; these are grouped roughly in a descending order of importance on the basis of attention or time given: (1) reducing feed cost of production; (2) better-bred livestock on every farm; (3) dairy-improvement associations and clubs; (4) wool and meat production; (5) livestock health and development; (6) junior livestock clubs.

The monthly ration service which has been provided for several years, is still demanded and is widely used in most counties. This service indicates the proper selection of feeds as to both cost and digestible nutrients. Suitable mixtures from the commonly used feeds have been proposed. As now offered, this information goes out in two forms. A general statement, known as the "Extension Feed Service," goes to the several counties the first of each month for publication in the *Farm Bureau News*. This statement gives the Syracuse prices on the standard ingredients, and proposes as a guide a suitable 18-per-cent-digestible-protein ration for dairy cows. To reach persons who may not read the county *Farm Bureau News*, a special personal letter is prepared which is sent by the county agent to

a special list of dairymen in the county. This communication, which is made personal in tone, discusses prices, indicates mixtures, and takes up other timely matters. The personal feed-service letter reaches more than 2000 dairymen each month.

Two special projects were outlined and completed during the year. In one it was proposed to cooperate with the Erie Railroad Company in the operation of a "Better-Bull Train"; in the other, to provide an instructive demonstration at the State Fair on the value of legumes in the rearing of heifers.

For the Erie bull train, the College became a cooperator with the railroad company by installing an educational exhibit for instruction at each stop. This exhibit covered the selection, feeding, and management of bulls, and the feeding and management of heifers. The object was to induce a bull owner to select bulls wisely, handle them economically, and rear their daughters in the best manner possible. Fifteen all-day stops were made in eight counties of southwestern New York. This afforded time for visitors to examine the exhibits and select such bulls from the breeds represented as they seemed disposed to buy. On the whole, the interest was good and in most places it exceeded expectations. The goal of fifty bulls placed as a direct result of the train was exceeded by one. A summarized record of this project follows:

Station	Attendance	Number of bulls placed
Canisteo	2,700	6
Friendship	525	2
Wellsville	1,100	7
Little Valley	400	2
Cattaraugus	1,200	3
South Dayton	1,000	3
Jamestown	275	1
Randolph	1,250	2
Warsaw	350	5
Attica	600	4
Avon	400	3
Bath	250	1
Addison	1,500	5
Elmira Heights	400	2
Owego	1,000	5
Total	12,950	51
Average attendance.....	863	

Total bulls placed, by breeds: Guernsey 20, Ayrshire 14, Jersey 10, Holstein 7.

At fourteen of the fifteen stops, \$1615 was raised which was used to give away fourteen bulls and one heifer calf. Owego raised the largest amount of money and gave away two bulls. Of the fourteen prize winners selecting bulls, six selected Holsteins, three Guernseys, three Ayrshires, and two Jerseys.

At the State Fair in 1925, an exhibit was arranged to show the relative value of timothy and alfalfa hay in the rearing of heifers. In connection with a state campaign for more legumes in the rations, this seemed a good opportunity to demonstrate the value of legumes in the rearing of a desirable class of heifers. Eight heifers were put on feed on May 1, and

were so continued for 120 days. A week later, six heifers, three from each lot, were shown at the State Fair. Over each animal was given her individual record including gains and feed cost. The contrast between the two groups was decidedly in favor of the alfalfa.

Since August 1, 1925, the junior livestock club work has been conducted by John P. Willman. During his first year's leadership, the interest in this work has been strengthened and there has been a noticeable increase in requests for meetings and for subject-matter materials. The number of calf and pig clubs, as well as the enrollments, has been largely increased. County-club agents have responded freely to overtures made by the College, and have given gratifying reports as to the value and effectiveness of this branch of the service. The exhibits of calves at the local fairs are the best yet noted, and there will be more calves, pigs, and sheep entered in junior classes at the State Fair this fall than in any previous year. The special activities for this division are included in the statement of activities in animal husbandry entered elsewhere in this report. They make up a substantial part of the total work done. Members are met in small groups, and, in addition to receiving elementary instruction in the feeding and management of livestock, they are aided in preparing the demonstrations which they will later give at fairs or elsewhere. Judging contests are held also, as a preparation for the county fair or the State Fair contest. The outlook for developments in this line is very encouraging.

A ram sale was conducted in Yates County by the county sheep-breeders' association, at the time of the county fair. It attracted rather wide attention. Fourteen breeders in near-by counties consigned twenty rams of six different breeds. More than half of the rams remained in the county. The average selling price was \$36.94; the highest price was \$65. The medium-wool type of rams seemed to be most in demand.

During the spring of 1926, department specialists spent four weeks in the field studying the causes of death among young lambs. This study was made in cooperation with the New York State College of Veterinary Medicine, the Department of Animal Husbandry carrying on the field work and the Veterinary College having charge of the laboratory work. Most of the investigation was conducted in Yates County, a section well adapted to the undertaking because the large number of flocks made it possible to carry on the work with a small amount of driving. The disease is not limited to this particular section. Specimens obtained indicate that it exists in Genesee, Tompkins, Schuyler, Cayuga, and Steuben Counties. The objects of the investigation were: (1) to study the disease prevalent among young lambs commonly called "stiff lambs"; (2) to determine, if possible, the nature and the causes of the disease; and (3) to study every possible means of preventing the occurrence of the disease. Accomplishments thus far may be summed up briefly as follows: (1) the symptoms of the so-called "stiff lamb" disease were catalogued; (2) the disease was found to have a definite set of post-mortem lesions by which it is possible to differentiate it from other diseases of young lambs due to poor hygiene, pneumonia, and other causes; (3) to date, however, all efforts to determine the cause of this disease have been fruitless, and very little progress can be made in its prevention until the

cause has been found. The fact that the disease occurs in lambs varying in age from two to eight weeks, limits the time during which it may be studied. Plans are being made to continue the study during the spring of 1927. A more detailed report of the work may be found in mimeographed bulletin No. 85, prepared by the department.

The year has shown an increased activity in all forms of dairy record-keeping in the State. There has been an increased demand for milk-weight sheets and herd-record books. On July 1, 1925, there were 25 dairy-improvement associations; on June 30, 1926, there are 31. During the year 6 associations have been discontinued and 12 new ones started, making a net gain of 6. There are three associations in Madison County and four in Delaware County. During the year 5395 milk-weight sheets, 1354 herd-record books for associations, clubs, and cow-culling service, and 178 barn-record books, were sent out. The number of herd-record books that have been summarized and returned to the owners is 247. In addition, 5173 cow-record strips have been filled out from these records and forwarded to the Bureau of Dairying at Washington.

The following tabulation shows certain results reported by the county agricultural agents for the year ending November 30, 1925. While some of the factors are not altogether satisfactory as measurements, they indicate that definite progress is being made.

Farmers feeding legume hay for the first time.....	712
Farms reporting gain in milk per cow by feeding legume hay.....	276
Was milk produced at greater or less feed cost by legumes?.....	Less
Was grain saved as compared with previous years by using legumes?.....	Yes
Farmers receiving monthly personal feed-service letter.....	7,807
Farmers reporting gain in milk production from silage.....	116
Bulls owned by two or three partners, purchased during year.....	14
Townships covered by livestock survey.....	30
Male stock enumerated in surveys.....	306
Grade or scrub males enumerated in surveys.....	265
Purebred bulls enumerated in surveys.....	306
Grade or scrub bulls enumerated—same area.....	265
Tried or proved bulls recognized during year.....	3
Farmers adopting regular exercise for bulls.....	26
Inferior bulls in test associations replaced.....	37
Test-association members purchasing purebred cows.....	55
Number of purebred cows purchased by members.....	153
Dairy-improvement clubs active.....	26
Members of dairy-improvement clubs.....	291
Milk-weight sheets distributed to farmers.....	6,336
Ewe flocks culled before breeding.....	3
Rams selected to head flocks.....	66
Farmers using green forage in summer for sheep.....	30
Sheep dipped.....	7,500
Sheep treated for stomach worms.....	641
Farmers using succulent feed in winter ration for sheep.....	10
Animals tested for tuberculosis.....	421,889
Herds under supervision.....	41,850
Barns in which light and ventilation have been improved.....	395
Stables in which a more sanitary watering practice has been adopted.....	213
Barns thoroughly disinfected and whitewashed.....	11,172
Farms where young stock have been separated from mature stock.....	31
Farms where systematic health records are kept.....	48
Method demonstrations given.....	208
Adult result demonstrations started.....	140

Adult result demonstrations completed or carried.....	106
Animals involved in completed demonstrations.....	2,501
Profit or savings on demonstrations.....	\$19,912
Farms assisted in obtaining purebred sires.....	445
Farms assisted in obtaining purebred or high-grade females.....	1,147
Farms culling herds for the first time.....	2,635
Animals in such herds or flocks.....	22,504
Animals discarded	1,719
Breed associations or clubs organized	8
Members in such associations.....	90
Cow-test associations organized or reorganized.....	37
Members in such associations.....	795
Farms not in associations testing cows.....	463
Farms feeding better-balanced rations for the first time.....	2,330
Farmers controlling insect pests for the first time.....	221
Farmers influenced to test for tuberculosis.....	37,872
Farmers adopting improved practices in livestock.....	40,422
Farms adopting improved practices in sanitary production of milk.....	5,780

Botany

The extension activities of the Department of Botany have consisted this year, as heretofore, in the distribution of cultures and information relating to the inoculation of the soil in preparation for leguminous crops, in answering letters regarding weeds and other plants, and in giving advice in the field concerning weeds. In 1925-26 approximately 20,000 inoculation cultures were distributed, and about 600 letters, mostly relating to legume inoculations, were answered. About 500 letters concerning weeds and plants were answered also.

Dairy Industry

The extension work of the Department of Dairy Industry has been prosecuted as actively as the limited personnel and time now available for this purpose would permit. Very important contributions have been made in the improvement of city milk supplies by working cooperatively with local health boards and municipal authorities for improved methods of handling and inspection and more rational ordinances. Important work has been done also with the dairy manufacturing interests of the State toward improved methods. The type of service given has involved a relatively large proportion of time in the office, developing plans, preparing articles for print, handling correspondence, and examining milk samples.

Entomology

The extension work of the Department of Entomology is divided into three parts: (1) control of injurious insects; (2) beekeeping; and (3) control of birds and mammals.

Control of injurious insects. Extension teaching in the control of insect pests has proceeded, in general, along the same lines as in recent years. The most important phase of this work is conducted in cooperation with the Department of Plant Pathology, and consists in maintaining a spray-information service administered through the farm bureaus in those counties in which the

growing of fruits and vegetables is an important industry. Success in previous years has led to a considerable increase in the number of counties covered by this service. In the following counties a special field assistant is employed during the growing season to direct the work locally: Dutchess, Erie, Greene, Monroe, Nassau, Orange, Ulster, and Wayne. In Chautauqua, Onondaga, Orleans, and Ontario Counties the county agent himself acts as special field assistant. In the following counties the service is conducted by the county agent without his being formally appointed as special field agent: Suffolk, Westchester, Rockland, Rensselaer, Albany, Saratoga, Essex, Clinton, Columbia, Madison, Oswego, Yates, Seneca, Genesee, and Wyoming. Much time and effort are spent by the extension entomologist in training and supervising the special field assistants and in assisting county agents in conducting the service in a practical and efficient way. Contact with the insect situation in each county is maintained, and an effort is made to get the proper information to the farmers at the time when they can use it to the best advantage, and to anticipate, as far as possible, the needs of the farmers in each locality. Information regarding the situation and the needs of those conducting the service locally is obtained by correspondence, by telephone, and by frequent visits.

In addition to the spray-information service, an extensive correspondence is conducted with individual growers, and instructions are given at extension schools, at farmers' meetings, and on fruit and potato tours.

In order to be able to give sound advice as to the importance of sowing wheat at the proper time, an examination of wheat fields is made just before harvest each year to determine the percentage of infestation by the Hessian fly. The results of this examination are sent to the wheat-growing counties so as to be available before planting time, and the farmers can time their sowing accordingly.

Beekeeping. The extension work in beekeeping was conducted along the usual lines. Field meetings, automobile tours, and demonstrations were conducted, covering the beekeepers' problems in systems of management. In the winter the beekeepers were assisted at annual meetings in adopting educational programs, and lectures on beekeeping were given at those meetings. To this kind of teaching, 124 days were given. A beekeeping news letter was issued monthly and mailed to a limited number of beekeepers. In November, 1925, a telegraphic cellar wintering service was sent out to beekeepers who wished to be notified as to the proper time for placing the bees in the cellar. This service was sent out through county agents and radio broadcasting stations, and to a few individuals who paid for the telegrams.

Control of birds and mammals. Information concerning the control of birds and mammals has been given in accordance with plans previously outlined, in the form of both lectures and demonstrations which have been planned to aid in the control of pests and to arouse interest in valuable forms of bird and mammal life. Wild-life conservation has been urged in lectures at schools and granges. By special arrangement it was again possible for one of the specialists to be in the field more of the time than formerly, with the result that the demands and needs of the farmers and the county agents are better understood.

The usefulness of birds in controlling injurious insect pests was emphasized in 40 lectures, at which the attendance totaled more than 11,000. Much time and effort were expended in preparation of lantern slides and motion pictures for use in these lectures. Assistance was given to groups which held bird-house-building contests, and the specialists acted as judges in these contests.

Further effort was spent on the study of the ruffed-grouse disease and other problems of game conservation. In the interest of fur farmers, several red foxes were kept for experimental use and many observations were made.

The control of rodent pests was the most urgent demand that called for attention. In spite of the many demonstrations in woodchuck control which were held in 1925, several county agents needed more assistance, and 37 demonstrations were given with an attendance of 247. During the spring months considerable time was given to a series of experiments testing the use of the various grades of cyanide in woodchuck dens. Results in 1925 were so successful that several counties organized campaigns this year and the specialist met with the various committees to advise with them.

Meadow-mouse control was effected in several of the fruit-growing counties by means of the poison bait recommended. Fifty farm visits to orchards were made, in company with the county agents, to look for mouse damage and to estimate the abundance of mice in the various localities. Subsequent reports show that the methods urged by the specialist aided in keeping down the numbers of mice in badly infested orchards.

Tests of various rat poisons were made at the college poultry plant and on private farms. In company with a representative of the United States Biological Survey, rat-control meetings and demonstrations were held in two counties. Further effort must be made to lessen the enormous loss caused by these pests.

The use of calcium cyanide against star-nosed moles in lawns proved successful in experiments, and it was therefore recommended in several instances.

During Farmers' Week in February, 1926, an exhibit was presented showing destruction caused by rodents and advocating methods of control. Interest was added by the use of a live meadow mouse actively engaged in girdling a fruit tree.

Many bulletins have been mailed in answer to requests for information on pest control and on the raising of birds and mammals in captivity. The correspondence was greater than usual and required much attention.

Floriculture and Ornamental Horticulture

The past season has been one of increased activity in the extension work of the Department of Floriculture and Ornamental Horticulture, as compared with previous years. According to the plan to withdraw field service during the season of 1926-27, a strenuous attempt was made to clear up all outstanding projects. This resulted in a heavier schedule, which, together with the fact that the specialist devoted eighteen days to field work and approximately twelve days to office work out of his va-

cation period, accounts for the advance. Even so, no new projects were assumed and a few old ones still remain unfinished.

Two noteworthy pieces of activity are: (1) The interesting of the civic sections of the Federated Women's Clubs of New York State in conducting contests and improvement work in rural sections. During the season many schools have been benefited from their efforts. (2) The establishing of a church garden club under the auspices of the National Plant, Flower, and Fruit Guild. This work is nation-wide. Plans were made for the Guild's activity, and a complete bulletin was prepared by the specialist on the subject of landscaping rural church properties. To date hundreds of these bulletins have been sent out.

As the program progressed, the imperative need of better and more complete teaching material was increasingly emphasized. This includes bulletins, slides, pictures, and exhibits for demonstration teaching. While it is a serious affair to curtail the field activity, this need is so great that during 1926-27 no field work will be handled, the specialist devoting his entire time and energy to these other problems.

Forestry

In the Department of Forestry, the year has been marked by constantly widening cooperation with various agencies throughout the State, by the continuation and expansion of projects previously started, and by the inauguration of new lines of activity. Financial aid received from the Federal Government through the United States Department of Agriculture, under the authorization of the Clarke-McNary Act, made possible the undertaking of work that could not have been handled under the state moneys allotted to this department. Particularly did this increase permit an inspection of the demonstration forest plantations that have been established during the past few years in a majority of the counties of the State with trees supplied by the State Conservation Commission. The federal money also permitted the employment of an extension stenographer, on full time for nine months, an addition to the clerical staff that was imperatively needed.

One very significant development this year has been the expansion of the junior project work in forestry, especially in cooperation with the local rod and gun clubs throughout the State. The plan is for the local sportsmen's club to finance reforestation projects in a manner similar to that followed in the past by many local banks in backing the junior project work with field crops. Planting and other operations are carried on with the cooperation of the county club leaders. Plantations are established in accordance with a carefully-worked-out program which insures that all work done shall conform to a recognized standard. On the satisfactory completion of the project, prizes are awarded for the most creditable accomplishment.

Another development this year has been closer cooperation with a number of the boards of county supervisors and local chambers of commerce in plans looking to the establishment of county and township forests. Also, additional contacts have been made with boy-scout organizations, especially in connection with reforestation work in the spring of 1926. In these and similar ways forestry has been brought home to many groups throughout the State whose interest had not previously been aroused.

The better care of existing woodlands has this year received renewed emphasis. Through conferences with the county agents, plans have been laid to establish demonstration areas on which, by means of improvement cuttings and thinnings made under the direction of the foresters, the woodlots will be brought into better shape and put in the way of being more productive assets to the farm.

As in earlier years, through the cooperation of the county agents, orders from farmers and other forest-land owners for forest nursery stock were assembled at the College of Agriculture and forwarded to the State Conservation Commission. This is done to facilitate the distribution, and to insure to the applicants the receipt at the time for planting, of the kinds and quantities of trees which they desire.

At the State Fair in 1925, the exhibit of the department centered in a demonstration of tree species that can be used as substitutes for chestnut in meeting the demands for woods suitable for posts. About 40 requests for further information were made to the extension forester as a result of the exhibit.

The contribution of the department to Farmers' Week was a connected series of lectures and an exhibit showing "King White Pine." The Conservation Commission prepared a demonstration of blister-rust control which formed a part of the general exhibit.

Even more than usual, the members of the forestry staff have been called on this year to assist in the work of national and state organizations having to do with one or another phase of forestry or with allied lines of work. Activity as chairmen or members of important committees, the preparation of articles for technical journals and other publications, and similar duties, have taken up much of the outside time of all the members of the staff.

Meteorology

Extension work in the Department of Meteorology is limited to talks on weather conditions and forecasting, before boy-scout meetings, rural church clubs, and other gatherings.

Plant Breeding

In the economic application of plant breeding to agriculture as treated by the Department of Plant Breeding, emphasis is laid upon heredity as of major importance. Adaptation and consequent productivity are hereditary responses to environmental conditions. Owing to the wide diversity of soil, climate, and length of growing season in New York, different strains may often be used to advantage in different localities. Experimental tests at the College determine those strains or varieties which are of probable value elsewhere in the State. The testing of these in various localities by the extension staff determines regional adaptation, and only those which are of assured worth are ultimately recommended and distributed to growers.

Seed is ordinarily handled by the trade as a commodity, but quality seed is in a high degree a specialty product, since its production must be carried on under careful supervision until the strain is well established and its

characteristics are widely known. Such procedure necessitates adequate inspection service, and this service is rendered by the extension staff of the department in cooperation with county agricultural agents and with the members of the New York Seed Improvement Cooperative Association. Standards of seed quality recommended by the extension staff have been officially adopted by this seed-certifying agency, and only seed which meets these requirements is eligible to certification. By this means the production of quality seed is achieved, and such seed has become a specialty product on many of the best farms in the State.

During the year, 485 farm visits were made. Of this number, 284 were for the purpose of seed inspection or to render assistance to growers in meeting the requirements for producing certified seed. The crops inspected included oats, wheat, rye, barley, corn, beans, buckwheat, and potatoes. In addition to seed-certification work, inspection visits were made as part of the local seed-improvement work of the county farm bureaus. By such inspection the quality of the seed from the standpoint of varietal purity and regional adaptation is determined. During the past year more than 120 growers received this service. About 70 growers attempted to produce certified seed under college supervision, and 935 acres were inspected.

Practically all of the material certified was sold and used as seed. Publicity was obtained by encouraging growers to advertise and by timely articles in the agricultural press. A large amount of inspected material not entered for certification was sold direct by growers or through seed firms as seed stock. Several excellent seed shows were supervised, and exhibits were made at the State Fair and at county fairs. Ten field demonstrations were held during the year.

The number of growers applying for inspection of crops for seed purposes is increasing each year. The number of acres of grain crops inspected for certification in 1926 is considerably in excess of that for 1925. This is evidence of interest in quality seed, both by producers and by the seed-buying public.

Plant Pathology

The spray-information service conducted by the Department of Plant Pathology in cooperation with the Department of Entomology, has been continued this year in much the same manner as last year. A detailed report of this service is given on pages 55 and 56. During the last three days of March a school for field assistants was held at the College to prepare them for more efficient service, and three days of the preceding week were also devoted to extra training for new appointees.

Potato-improvement work has been conducted by rendering assistance in the development of the practice of seed and soil treatment and in conducting seed-source tests; by giving talks on potato tours and at field meetings, community meetings, and extension schools; by publicity through printed leaflets, news items, and correspondence; and by maintaining a seed-potato inspection service in connection with the New York Seed Improvement Cooperative Association. The practice of treating seed potatoes with corrosive sublimate has become well established in the State, largely.

it is believed, as a result of extension work. This project consists largely in supplying information to the many requests for it, and in demonstrating the hot-solution treatment and the method of testing the strength of the solution. The demonstration of the treatment of the soil for the control of scab in Nassau County was continued. The seed-source demonstrations on Long Island were conducted again in 1925, with no abatement in interest. The value of these demonstrations in connection with the annual tour extends not only to Long Island farmers and dealers, but also to the growers of the seed in upstate New York, in several other States, and in the eastern provinces of Canada.

Interest in tours and field meetings has continued. There were 19 tours and 23 field meetings held in 19 counties, and the attendance amounted to 1149. The subject of potato diseases was discussed also at community meetings and extension schools.

Potato inspection was afforded to members of the New York Seed Improvement Cooperative Association as usual. Inspections were made of samples of 195 sources of seed grown on the college farm, and of 312 fields containing 1522.5 acres on 182 farms in 27 counties. Three inspectors were employed. The total cost of this inspection to the growers was \$2712. This amounted to 66 cents an acre for each inspection, or 1.15 cents a bushel for the potatoes certified. This cost does not include the services of members of the staff and the office force in planting samples, keeping records, conducting correspondence, and so forth. The usual three inspections were made during the summer and fall.

A test of samples was made in Florida again this year, from 27 selected seed stocks which were thought to be promising for foundation stock. These were planted at Hastings in January and were inspected in March. The cost of the project amounted to \$172.60, the greater part of which was paid by the growers who submitted samples. The value of this project to growers consists in giving them information in respect to the quality of their stock for seed purposes, so that they can determine in advance of planting whether to buy new seed or to plant their own, whether to change their acreage to be entered for inspection, the location of better seed stock, the amount of roguing to be done in case their own seed is planted, and whether the salability of their stock is improved.

An important part of the extension work of this department was concerned with cauliflower-disease control in Delaware County. A series of community meetings were held during the winter of 1924-25, at each of which a grower was elected to conduct demonstrations. Visits were made later by the specialist and the county agent to check the measures taken and the results obtained. Information in regard to control was given to every grower. Seed treatment and seedbed disinfection were measures recommended. Work on disease control was provided for growers of brussels sprouts, witloof, and other vegetables, in Albany, Rensselaer, Schenectady, Madison, Chemung, Wayne, Monroe, Orleans, Niagara, Erie, and Nassau Counties. Requests for demonstrations during 1926 in celery-blight control have been received from Steuben County.

This year the department has inaugurated a news-letter service for vegetable growers, consisting of 27 letters sent to county agents just before the time when the information can be used by growers. The county

agents mimeograph these and send them to vegetable growers of their counties. Copies are being sent to twenty county agents requesting and agreeing to make use of them.

A few requests were received for work on the control of bean diseases. Bean blight was especially severe during 1925, particularly on the red kidney variety. Experimental work must offer some practical solution of the problem before extension workers can give the growers any assistance. Disease control with pea and marrow varieties is fairly satisfactorily accomplished by the use of resistant varieties that have been developed.

The project for the control of tobacco wildfire has been discontinued until growers become interested in it again. The relative unimportance of the disease during the past two years accounts for the disinterestedness of the growers. The work during the past year consisted of the preparation of a news article and visiting the seedbeds of growers.

In the matter of grain-disease control, a large number of leaflets giving directions for the control of wheat, barley, and oat smut have been distributed. The loose smut has been especially troublesome on Honor wheat and on Alpha barley. A more convenient and safer treatment than the hot-water method is greatly needed, and should become a project for further investigation.

The plant-disease survey is one of the most important projects of the work in plant pathology, but is much neglected because of lack of time. During the year data have been compiled on approximately 600 diseases, nearly all of economic plants, from reports of the various field men and county agents and of faculty members at Geneva, Syracuse, and Cornell. No special surveys were made because funds were not available for this purpose. Such surveys are important and should be made from time to time. A survey of the 1926 wheat crop should be made in order to determine whether it will be desirable to call special attention to the control of stinking smut.

During his vacation period, from January to March inclusive, Professor M. F. Barrus visited San Domingo and Porto Rico. In Porto Rico he identified himself with the extension service of the Insular Department of Agriculture and Labor. He gave a course of lectures on plant pathology to students of the College of Agriculture at Mayaguez, and a course of lectures on extension work to the agricultural agents assembled at Rio Piedras. Professor Charles Chupp, during his vacation period from April to June inclusive, devoted his time to an investigation of vegetable diseases at the New Jersey Agricultural Experiment Station.

Pomology

The extension work of the Department of Pomology has been conducted during the past year in accordance with the established long-time plan, comprising ten subprojects. Emphasis is placed on certain of these subprojects according to the dominant needs of the time. This year emphasis has been placed on the subprojects which are particularly destined to give rather immediately larger financial returns or to effect an economy in production. This was in harmony with the broad program of the College as a whole, and involved the following points:

1. A more judicious and discriminating use of fertilizers. Instead of applying plant food generally, because of a blind faith that it will do good, the grower is advised to make trial applications before fertilizing his entire acreage. The natural sources of plant food, cover crops, and legumes, have usually proved to be sufficient to maintain soil fertility.

2. A better-balanced pruning program. Less severe pruning of young trees and more severe pruning of older trees.

3. The elimination of non-standard, low-quality, and unprofitable varieties, either by pulling or by top-grafting as conditions warrant.

4. Better methods of grading and packing.

The work was furthered by the usual avenues of demonstrations, community meetings, extension schools, conferences, farm visits, and the printed word. The results accomplished are not easily measured. In one community, orders for three carloads of fertilizer were canceled because the extension specialist showed that the material was of little value in that section. Under other conditions where fertilizers were needed and have given results at demonstrations, their use has been greatly stimulated, and county agents report that carloads have been ordered where only a few sacks were sold before.

Observations in orchards of the State indicate that less severe pruning of young trees has been rather generally accomplished. This is the result not only of this year's work, but of a rather concerted effort in this direction during the past four or five years. The progress made in more severe pruning for older trees is not so generally evident. The pruning of such trees is particularly dependent upon the economic conditions prevailing in the industry, and these have not been very satisfactory. The extension specialists are convinced, from their contacts in the field, that their teaching has considerable influence in preventing more general neglect.

Unprofitable varieties are slowly but surely giving way. In the case of trees under twenty-five years old, more top-working is being done each spring. Older trees are being pulled.

Better methods of grading and packing are making less satisfactory headway, because the price of apples has been so low as to discourage improvement.

Despite the fact that economic conditions are far from satisfactory, the growers, having survived the catastrophe of 1923, have not lost courage but are looking with hope toward the future. Interest has been very good, and attendance at meetings, at least during the fall and winter, was better than last year; while the total number of contacts is well up to the average.

Aside from the field work, the extension specialists have carried out the usual routine of office duties. These duties consist, in the main, of answering correspondence, correcting papers, and doing other work in connection with two reading courses; making arrangements for Farmers' Week; and preparing material for charts, articles, bulletins, and so forth. All of these duties have demanded more than the usual attention. Five articles a month, of seasonal application, have been supplied for the *Farm Bureau News*. Other special articles for publicity purposes have been very generally used and have enjoyed a wide circulation.

Poultry Husbandry

A statistical summary of the extension activities of the Department of Poultry Husbandry shows the total number of teaching contacts for the year to be 26,821. These contacts were made through five types of projects, with the number of persons reached as follows: by demonstrations, 8482; by conferences, 725; by lectures, 17,097; by farm visits, 517. In addition to these, there were many more contacts which it is impossible to record satisfactorily, and difficult even to estimate approximately. About 10,000 letters were written, and more than 45,000 poultry bulletins covering nine subjects were distributed. Additional contacts were made by conversations during 42 days spent with educational exhibits; by judging at 15 poultry shows; by conducting 19 poultry tours; by delivering 5 radio lectures; by meeting more than 1000 persons during Farmers' Week; by teaching at the Cornell poultry-judging school, having an attendance of 103 persons; and in connection with numerous breed-improvement projects, such as paid culling (involving 36 counties where 234,650 birds were handled and 62,417 birds were culled at a cost of \$4231, or 6.95 cents a bird) or certification of breeding poultry (in which 76,056 birds were individually examined and 39,832 birds were officially seal-banded as choice certified breeding birds on 223 farms).

Altogether there have been 198,895 birds certified since the project was established in 1918. The influence on the laying value, purity of breeding, and vigor of poultry in the State, has been very marked.

It is significant that as a result of many years of educational effort through extension teaching, the paid culling and certification projects are now and have been for many years entirely self-supporting; that is to say, the services are wholly paid for by the flock owners who receive the direct benefit.

The New York State Advanced Registry, which has been in successful operation for many years and is the only project of its kind in the United States, serves the highly useful purpose of enabling a few progressive poultrymen to procure at cost a large number of valuable pedigree chicks from a few of their best hens. In the past year, six poultrymen received from the 73 supercertified trap-nested hens at the college poultry farm 1404 wing-banded chicks, or an average of 19 chicks to a hen. The project is self-supporting except for the wages of the caretaker, and it is capable of wide expansion.

Among other major extension activities of the department are:

1. The holding for four years of the New York State poultry-production show as a demonstration in judging poultry for production and in methods of conducting such shows. The number of exhibitors at the last show was 82, and the number of birds was 1272. This involved a total expenditure of \$956, of which \$656 was contributed by the exhibitors.

2. A six-days poultry-judging school held at Ithaca. This project has been continued for nine years, with an attendance, including students and staff, of about 120 persons each year. The number of persons attending to date is 854, representing 40 States and 3 foreign countries.

3. The poultry cost-account record project, which was started in 1918 and has resulted in the obtaining of 167 complete cost-account records of poultry farms in 21 counties.

4. Boys' and girls' poultry-club work. There are now in New York State 2521 persons cooperating in the boys' and girls' poultry-club work. This is one of the most popular and effective teaching projects, and leads naturally to other forms of cooperation.

5. The poultry reading-courses. Approximately 300 persons take the correspondence courses, which appear to be one of the most effective means of reaching persons who cannot take courses at the College and are a fruitful source for stimulating further educational endeavors.

Rural Education

The Cornell Rural School Leaflet, prepared by members of the Department of Rural Education, was distributed approximately as follows in the period from July 1, 1925, to June 30, 1926: September issue, 24,300 copies; November issue, 144,700; January issue, 141,600; March issue, 142,000. It has been impossible to supply the demand for the leaflet, especially from outside the State.

In addition to the extension activities represented by the junior-extension work (reported on pages 39 and 40) and the Rural School Leaflet, several members of the staff have participated in conferences held by school superintendents and parent-teachers' associations. The demand for this service is greater than can be met by the department.

Rural Engineering

The extension work of the Department of Rural Engineering is conducted under five subprojects, as follows: (1) to promote better land drainage; (2) to promote the better use and repair of gas engines and other farm and home machinery; (3) to encourage the installation of sanitary water-supply and sewage-disposal systems; (4) to encourage the betterment of farm buildings; (5) to extend junior-project work in farm-mechanics subjects.

In drainage, the economic depression has for the time being limited the interest in extensive undertakings. There were laid out 9155 rods of tile drain to serve approximately 383 acres of land, and 6270 rods of open ditch which will make possible the drainage of 1490 acres of land now nearly unproductive. Practically all of this drainage has been installed largely by the individual labor of the farmers. A part of the work of the department consists in warning against injudicious or impossible undertakings. The projects actually installed are being indicated by signs, and will stand for years as demonstrations of the benefits resulting from drainage.

In machinery, practically all of the extension work takes the form of "schools," of which 192 were held during the year, in 31 counties, as follows: farm blacksmithing, 15; gas engine (four days), 10; advanced gas engine, 3; tractor, 4; shop (one day), 26; shop (three days), 1; sewing machine (one day), 129; household mechanics (one day), 3; gas engine and shop (five days), 1. The total number of men and women reached through schools was 2219, and the total number of contacts for all department specialists in schools was 12,074.

The 129 sewing-machine schools were held in 29 counties with 1728 women in attendance. There were 1351 sewing machines brought in to the schools and cleaned and adjusted by the women themselves. This service alone was worth from \$4 to \$6 to each woman participating. The assistance which they will extend to their neighbors will be of large additional value, and, in addition, this training should help decidedly in giving the women confidence and skill in handling other domestic equipment.

A new school, the care of the automobile, has been organized and offered for women. This school should be in considerable demand in the future.

In the promotion of home conveniences, the department has for years expended much energy in demonstrations, bulletins, and advice by letter. During the past year 29 visits were made, with a total attendance of 62 persons, and three meetings were held, with an attendance of 78.

In the matter of farm structures, considerable assistance was given by mail and eight barn meetings were held with 200 persons in attendance. Two men spent 36 days in the field studying barn ventilation. As soon as research work and bulletins now under way are completed, this work will be vigorously pushed.

The junior-project work in farm-mechanics subjects has grown considerably during the past year. About 550 boys were enrolled and their exercise material was carefully corrected at the College and returned with detailed criticisms attached. During the past year a new project, woodworking, has been organized.

Rope splicing and knot tying were the topics for ten meetings held in four counties. These meetings were attended by 146 men, who, because of the near approach of haying, were especially interested.

Rural Social Organization

The extension work of the Department of Rural Social Organization has continued its steady growth. The total attendance at meetings this year was 19,649, an increase of 36 per cent over last year.

Emphasis has been placed this year upon the training of leaders in various types of community work, such as recreation, dramatics, and civics. Advice has been given to communities on various matters dealing with community organization, such as the building of a community house or a gymnasium, the organization of a community council or a local farmers' club, the planning of a parish house and program, and the furnishing of program material to granges and other similar organizations. The demand for this work is shown by the fact that the average attendance at such meetings has been above 1000 a month.

The building of school or village playgrounds has been one of the new features of the recreation work this year. It has not been possible to give to this work any more time than was sufficient to get it started in a county. In one county where assistance was given in the building of a playground, within three months two near-by communities had constructed similar equipment. In another county, five playgrounds have been built to every one that was built in that county nearly a year ago.

In dramatics there have been 24 classes in which 517 pupils were trained. These represented 161 communities in 16 counties. The teaching methods employed in this work, and the character of the instruction given, have been improved during the year, and interest in the project is developing rapidly. In a number of cases members of the classes have made unusual sacrifices to take this training.

A distinct step in dramatics was made in the development of the intercounty contest between Tompkins County and Madison County, which was held at Cazenovia on May 7. It was an experiment, but proved very successful. Other similar contests are developing, and the competition between communities in the Little Country Theater at a number of county fairs has already become keen. It is felt that the project offers a most wholesome and stimulating diversion.

The department has tried to meet the needs of communities by lending books, plays, or other material for use in preparing special programs. More than 3000 requests for such material have been met, of which 2362 were for short plays and 162 were for long plays.

Vegetable Gardening

The Department of Vegetable Gardening has made no marked changes in its extension program during the year. The chief problems are still the securing of reliable seeds of varieties and strains adapted to the different regions of the State; the maintenance of soil fertility through more general use of green-manure and cover crops; the more intelligent use of stable manure and commercial fertilizers; more economical production through a greater use of machinery and better cultural practices; better planning of home gardens so that a continuous and adequate supply of vegetables of the kinds recommended by the nutrition specialists may be available; better storage for vegetables stored on the farms and in the homes; better grading of vegetables for market, and the standardization of grades; better packing and handling methods, and the standardization of packages. Progress can be reported in all of this work.

In the better-seed project, special attention has been given to cabbage, cauliflower, celery, field beans, and potatoes, although some attention has been given to various other crops also. A large proportion of the growers of cauliflower and celery are using seed of known performance as determined by tests and demonstrations conducted by this department. Growers of all kinds of vegetables are giving more serious attention to seed sources than ever before. The demand for certified seed of field beans resulted in the establishment of certification and inspection service by the New York Seed Improvement Cooperative Association in 1924. The inspections are made by a specialist of this department. In 1924 seven growers produced certified seed, while in 1925 the number increased to twenty-two and the number of acres inspected was 298.

As a result of the extension activities of the nutrition specialists and the vegetable specialists, the demand for information on the home storage of vegetables has been greater than the department could meet. The campaign for better storage has been successful.

Competition between lettuce growers of New York and those of some of the western States has made grading more important than ever before. Efforts have been made for the past few years to induce growers to use the federal grades, but only a few have done so. However, the campaign is bringing results, as is shown by the fact that one large organization has agreed to use standard grades and to employ shipping-point inspectors for the 1926 crop. Better grading is being done with various vegetables, even though the grades are not standardized. In the case of potatoes, six dealers in an important producing county are cooperating with the College in a campaign to improve the quality. These dealers have agreed not to accept potatoes unless they meet the requirements of the federal grades. To meet this standard, better seed must be used and better cultural and handling methods employed.

In package standardization, definite progress has been made during the year. One large group of growers of cauliflower have agreed to use a standard crate instead of crates of three different sizes, as heretofore. At the request of the New York State Vegetable Growers' Association, the Legislature passed a bill to standardize the lettuce box and the celery crate. Lettuce grown for shipment will be packed in one type and size of box, instead of in three types as in the past. Celery will be packed in one size of crate, instead of the two sizes in use during the past few years. This standardization will tend to reduce the cost of packages and eliminate confusion. The celery crate legalized as the "standard celery container" is the one recommended by this department as a result of experimental work in the handling and storage of this product.

FINANCIAL SUMMARY

A statement of receipts and expenditures for the year covered by this report follows. A detailed statement covering the funds received from all sources is contained in the annual report of the Comptroller of Cornell University. That report may be obtained on application.

FINANCIAL STATEMENT, 1925-26

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1925	Receipts (college and Smith-Hughes) 1925-26	Expenditures 1925-26	Balance	
						Lapsed	Unexpended June 30, 1926
State							
1924-25 Maintenance.....	\$1,420,160.00	\$1,313,217.13	\$ 115,942.87	.....	\$ 84,359.95	\$31,562.92	.....
1924-25 Schoolmaster maintenance.....	16,500.00	14,548.27	1,951.73	.....	1,785.87	165.86	.....
1924-25 f and t, and reason.....	45,000.00	44,286.88	713.12	.....	685.71	27.41	.....
1925.....	39,000.00	19,932.46	19,067.54	.....	19,067.52	0.02	.....
1925.....	17,100.00	13,800.00	3,300.00	.....	.....	3,300.00	.....
1925.....	7,424.68	3,790.28	3,634.40	.....	.....	3,634.40	.....
1925-26.....	1,350,146.00	.....	1,350,146.00	.....	1,241,576.17	.....	\$108,569.83
Total.....	\$2,904,330.68	\$1,409,595.02	\$1,494,735.66	.....	\$1,347,475.22	\$38,690.61	\$108,569.83
Federal							
Morrill and Nelson.....	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch, Adams, and Purnell.....	38,550.00	.....	38,550.00	.....	38,550.00	.....	.....
Smith-Lever.....	133,402.11	.....	133,402.11	.....	132,945.87	\$46.24	.....
Smith-Hughes.....	.....	.....	*(1,621.76)	\$20,675.58	21,785.59	.....	*(2,731.77)
Total.....	\$192,042.11	.....	\$190,420.35	\$20,675.58	\$21,3281.46	\$56.24	*(2,731.77)
College							
Tuition and fees.....	.....	.....	\$47,558.63	{ \$ 53,422.26	\$232,897.76	.....	1862,770.36
Sales and services.....	.....	.....	10,000.00	{ 183,983.26	10,000.00	.....	.....
General Education Board.....	\$10,000.00	.....	.....	.....	.....	.....	.....
Total.....	\$10,000.00	.....	\$57,558.62	\$237,405.52	\$242,897.76	.....	1862,770.36
Grand total.....	.....	.....	\$1,742,714.63	\$258,081.10	\$1,803,654.44	\$39,236.85	\$168,608.42

* Overdrafts on Smith-Hughes Fund covered by subsequent remittances from the State Department of Education.

† Reflects \$10,703.98 (net) interdepartmental transactions between the College of Agriculture and the College of Home Economics.

CONCLUSION

We record in conclusion our appreciation of your effective administration of the affairs of the College of Agriculture and of your generous aid to us, particularly throughout the not wholly uneventful period during which, in the absence of Dean Mann, we were directly in charge of the college administration.

Respectfully submitted,

CORNELIUS BETTEN,
*Director of Resident Instruction
and Acting Dean.*

R. W. THATCHER,
Director of Experiment Stations.

C. E. LADD,
Director of Extension.

INDEX

	PAGE
A	
Agricultural Economics and Farm Management, extension work.....	47
Agricultural Economics and Farm Management, research.....	18
Agronomy, extension work.....	50
Agronomy, research.....	21
Alfred, experimental work at.....	16
Animal Husbandry, extension work.....	51
Animal Husbandry, research.....	21
Appropriations of Legislature for 1926-27.....	9
B	
Barrus, M. F., work in Porto Rico.....	62
Bayer Company, Incorporated, fellowship.....	10
Beekeeping, extension work.....	56
Betten, Cornelius, report.....	7
Birds, extension work on.....	56
Botany, extension work.....	55
Botany, research.....	22
Brownell, W. A., appointment.....	12
Building program.....	9
Butts, G. S., appointment.....	41
C	
Canning-crops investigations.....	16
Champlain Valley Fruit Growers' fellowship.....	10
Chupp, Charles, studies in New Jersey.....	62
Churchville, experimental work at.....	16
College of Agriculture, transfer to Department of Education.....	7
Conferences held at College.....	14
Conley, Emma, appointment.....	12
Cook, D. S., resignation.....	41
County and town fairs.....	35
County extension boards.....	10
D	
Dairy Industry, extension work.....	55
Dairy Industry, research.....	23
Directors' report.....	7
Division of Education, University.....	12
E	
Education, University Division of.....	12
Enrollment of students.....	13
Entomology, extension work.....	55
Entomology, research.....	24
Experiment-station activities.....	15
Extension-methods handbook.....	36
Extension schools.....	35
Extension service.....	31
Extension specialists' field activities, summary of.....	37
F	
Faculty. <i>See</i> Staff.	
Fair exhibits.....	35
Farm and home institutes.....	34

	PAGE
Farm bureaus.....	10
Farmers' Week.....	11
Farrand, Livingston, letter of transmittal.....	11
Fellowships	11
Field Days, Junior.....	12
Financial summary.....	12
Floriculture and Ornamental Horticulture, extension work.....	14
Floriculture and Ornamental Horticulture, research.....	14
Forestry, extension work.....	15
Forestry, research.....	15
Fredonia, experimental work at.....	15
Funds, special.....	16

G

Geneva, agricultural experiment station at.....	17
---	----

H

Ham, L. P., appointment.....	4
Henrici, A. F., appointment.....	12
Herman Frasch fellowships, expiration of.....	10
Home and farm institutes.....	34
Home Economics, research.....	26
Hopkins, E. F., appointment.....	11
Hunn, C. E., death of.....	11
Hunn, C. J., appointment.....	11, 12

I

Indian extension	33
------------------------	----

J

Junior extension.....	33
Junior Field Days.....	33

K

Kendrick, M. S., appointment.....	12
-----------------------------------	----

L

Ladd, C. E., report.....	7
Lantern slides, loan of.....	33
Law relating to administration of College and other units.....	8
Legislative enactments.....	7, 9
Loan Fund, Max Schling.....	10
Long Island vegetable research farm.....	10

M

Mammals, extension work on.....	16
Mann, Dean A. R., leave of absence.....	11
Max Schling Loan Fund.....	10
Meetings held at College.....	14
Meteorology, extension work.....	9
Meteorology, research	26
Myers, C. H., work in China.....	11

N

News service	4
News-writing schools	4
New York State Agricultural Experiment Station at Geneva.....	17
Noble, C. V., resignation.....	11

	PAGE
O	
Occupations of former students.....	13
P	
Plant Breeding, extension work.....	59
Plant Breeding, research.....	26
Plant Pathology, extension work.....	60
Plant Pathology, research.....	26
Pomology, extension work.....	62
Pomology, research.....	28
Potash Importing Corporation fellowship.....	10
Poultry Husbandry, extension work.....	64
Poultry Husbandry, research.....	29
President's letter of transmittal.....	5
Prizes	10
Publication, Office of.....	41
Publications, distribution of.....	41
Publications, list of.....	43
Publications, summary of.....	47
Purnell funds, projects under.....	15
R	
Radio service.....	34
Reorganization of State Government.....	7
Research activities	15
Ross, H. E., work in Argentine Republic.....	11
Rural Education, extension work.....	65
Rural Education, research.....	29
Rural Engineering, extension work.....	65
Rural Engineering, research.....	30
Rural Social Organization, extension work.....	66
Rural Social Organization, research.....	30
S	
Schling, Max, Loan Fund.....	10
Shiley, R. P., transfer to College of Arts and Sciences.....	12
Staff, changes in.....	11
State Fair.....	35
Stevenson, H. A., resignation.....	11, 41
Stocking, W. A., death of.....	11
Student enrollment.....	13
Students, former, occupations of.....	13
Study courses, farm.....	41
T	
Tatcher, R. W., report.....	7
Town and county fairs.....	35
U	
Union Sulphur Company fellowship.....	10
University Division of Education.....	12
Urbana, experimental work at.....	16
V	
Vegetable Gardening, extension work.....	67
Vegetable Gardening, research.....	31
Vineyards, experimental, outlying.....	16
W	
Western New York Farms Corporation fellowship.....	10
White, Adelin S., appointment.....	11
White, Adelin S., resignation.....	11
Worke, G. A., special leave of absence.....	11
Wright, W. J., sabbatic leave.....	39

State of New York

New York State College of Agriculture
at Cornell University

Cornell University Agricultural Experiment
Station

Fortieth Annual Report
1927

LIVINGSTON FARRAND, President of the University
A. R. MANN, Dean of the College

CORNELIUS BETTEN,
Director of Resident Instruction

R. W. THATCHER,
Director of Experiment Stations

C. E. LADD, Director of Extension

Transmitted to the Legislature January 16, 1928

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE DEPARTMENT OF EDUCATION

Albany, January 16, 1928

HON. JOSEPH A. MCGINNIES, *Speaker of the Assembly, Assembly Chamber, Albany, N. Y.:*

SIR: Pursuant to law, the Fortieth Annual Report of the New York State College of Agriculture and of the Cornell University Agricultural Experiment Station is herewith submitted to the Legislature.

Very respectfully yours,

CHESTER S. LORD,
Chancellor of the University.

FRANK P. GRAVES,
President of the University and Commissioner of Education.

PRESIDENT'S LETTER OF TRANSMITTAL

September 10, 1927

The Governor of the State of New York,
Albany, New York.

The Commissioner of Education,
Albany, New York.

The Secretary of the Treasury,
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

The Act of the Legislature of the State of New York in 1926 accomplishing the reorganization of the State Government, provides that the New York State College of Agriculture at Cornell University shall make annual report of its general operations and expenditures to the Commissioner of Education.

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the fiscal year 1926-27 of the New York State College of Agriculture and the Cornell University Agricultural Experiment Station.

On the completion of the first year under the general financial supervision of the State Department of Education, it is a pleasure to acknowledge the unfailing courtesy and consideration which these institutions have received from the Commissioner of Education and other officials of the Department of Education. Adjustments to the new procedures in accounting have been free from difficulties and cordial cooperation has prevailed. Indeed, the voluntary assistance of the Department of Education in other than the financial affairs of these institutions has been most gratifying and beneficial, and has contributed toward their successful operation.

While the failure of the Legislature to grant the increased appropriations for the State College of Agriculture which were urgently requested and which the proper maintenance of the College requires, has involved

serious hardship for the College, nevertheless acknowledgment should be made of the courteous treatment which the affairs of the College have been accorded by the several officers and departments of government with which it deals. The facilitation of the financial and business aspects of the institution is directly reflected in the efficiency of its educational and research activities and in the spirit of the staff. Whatever contributes toward the simplification of the necessary financial arrangements for the conduct of the State's business, contributes at the same time toward the largest success and satisfaction in the technical and professional work of the institutions. This is notably true in educational and scientific work. Cornell University is highly appreciative of the cordial cooperation of the authorities of the State in furthering the work of the State institutions under its administration.

In the report submitted herewith a record is made of the more important activities and accomplishments of the College and the Station during the past fiscal year. Some of the pressing needs are indicated. The scope of the teaching, research, and extension activities is impressive of the demands which agriculture is now making of its institutions. The high place in agricultural production which New York occupies among the States is the justification for rendering every possible assistance to its maintenance and further development. It is probable that the public has little realized the prominence of agriculture in New York, and the facts herein reported should therefore be of general interest. It is the aim of the University to render the highest service which its funds and facilities permit to this industry of leading importance and to the large body of our population engaged therein.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE AND OF THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION FOR THE YEAR 1926-27

June 30, 1927

To the President of the University:

SIR: I have the honor to submit a report of the New York State College of Agriculture and of the Cornell University Agricultural Experiment Station, for the fiscal year 1926-27.

Agriculture in New York State

New York is so important commercially and industrially that its high rank in agriculture is not generally appreciated. The presence of abandoned farms, particularly in certain regions, also operates to prevent a clear recognition of the actually high place of the State in American agriculture. When population was congested in the Atlantic States, at a time when farm machinery was little used, several million acres of land in New York were cleared that were not well adapted to farming and that are wholly unsuited to farming under present-day conditions. Most of this land is good forest land; it is better adapted to trees than is most of the good farm land. Its idle and desolate appearance discredits the really progressive agriculture of the State. The State should be judged by the farms which are operated and not by those which are idle, even although the latter involve important problems of state policy.

In order to present briefly the facts which should be known as a basis for state policy with respect to agriculture, Doctors G. F. Warren and F. A. Pearson of the College Department of Agricultural Economics and Farm Management have prepared the following statement of the present situation:

In the past forty-five years, 4,500,000 acres of land have gone out of farm use in this State. A part of this has been taken over by cities, forest reserves, railroads, and the like, but a large part of it is still idle. If the State had planted trees on this land, its wealth would be increasing, its whole aspect improved, and the character of its agriculture would be more evident. The progress in replanting some of these areas in recent years should be accelerated.

At the same time that the area of land operated as farms was decreasing in the State, the acres of crops were practically stationary and yields per acre were rapidly rising. In thirty years crop yields increased 25 per cent. New York farmers are today producing more food than was ever before produced in New York State.

In 1925, New York ranked eighth among the States in total value of farm crops and sixth in the value of animal products, even although it ranked only twentieth in area of land in farms and twenty-ninth in total

state area among the States of the Union. New York tied with Ohio for seventh place in value of crops and animal products combined.

New York's most important farm product is milk. According to the 1920 census, this State ranked second in the value of dairy products and produced one-eighth of the total value of the Nation's dairy products. While some milk produced in other States and in Canada enters New York, an even larger amount of New York milk and cream is shipped to New Jersey, New England, and other States. New York produces enough milk and cream to supply the State, and in addition about one-third of the milk handled in commercial plants is used in the production of butter, cheese, evaporated and condensed milk, and other manufactured milk products.

The milk supply for New York City is considered to be the best supply for any large city in the world. There is no other place in the world where there is produced so large a volume of milk of such uniformly high quality as in New York State.

The number of cows in the State has remained practically constant for sixty years, but the milk production has almost doubled in this period. The average milk production for all cows in the State is about 5,500 pounds. This includes many cows that produce milk for cheese factories and for home use. The average production in districts that produce Grade A and Grade B milk is about 6,200 pounds. On farms in Denmark, the average is about 6,300 pounds. In that country, cows are often milked three times a day. If New York cows were milked three times a day, production would be much higher. At present labor costs it does not pay the New York farmer to milk more than twice a day.

According to the 1920 census, the State ranked eighth in the value of eggs and produced about one-twentieth of the United States total value.

No other State has such a diversified list of important crop and animal products. While sheep, hog, wheat, and oat production are not major interests in this State, considerable amounts of them are produced. The State has never ranked high in corn production, but it is nevertheless second in the number of farmers growing corn for the silo.

In 1919, New York ranked second in the value of apples, being exceeded only by the State of Washington. New York produced nearly one-ninth of the value of this important crop.

The census of 1920 reports that New York ranked first in the production of potatoes, and had 10.9 per cent of the total value of the United States crop. It took first place also in the value of hay, cabbage, sweet corn, raspberries, parsley, salsify, teasles, willows, carrots, and currants.

It was second in the value of dairy products, apples, buckwheat, grapes, maple sirup and sugar, lettuce, nursery stock, dry onions, cauliflower, celery, greenhouse flowers, parsnips, pears; and it ranked second in the total value of all vegetables and produced one-ninth of the total value of the national output of vegetables.

It ranked third in the value of dry beans, cucumbers, honey and wax, kale, green peas, radishes, squash, and turnips. It was fourth in the value of hops, horse-radish, and rhubarb. It stood fifth in farm-forest products, cherries, greenhouse vegetables, pumpkins, and tomatoes.

The State ranks second in the number of trucks on farms, thirteenth in the number of automobiles, and fifteenth in the number of tractors.

Niagara County, New York, has more tractors per square mile than any other county in the United States. The State ranks fourth in the value of farm machinery and farm buildings.

In 1920, New York ranked fifth in the amount of farm products sold cooperatively.

New York State, with a total land and water area of 49,000 square miles, is only 3 per cent smaller than England in total area, and is four times as large as Holland or Belgium, nearly one-third as large as Germany, and one-fourth as large as France.

In the United States, one-half of the total area is in farms, but in New York State two-thirds of the area is in farms. In 1925, New York State had 188,754 farms containing 19,269,926 acres. The value of the farms in 1920 amounted to \$1,400,000,000. If the value of livestock, equipment, feed, supplies, crops, and other materials usually inventoried is added, the total value would be about two billion dollars.

About one-half of the farms are free from mortgage debt. Seventy-nine per cent of the farms are operated by their owners.

New York State contains one-tenth of the total population and one-fortieth of the farm population of the United States. The farmers are nearly all experienced workers, and 86 per cent are native-born. Data are not available, but it is believed that the State ranks first in both the number and the percentage of college-trained men who are farming.

The State is second in the number of farm homes supplied with running water; fifth in the use of gas and electric lights; and twelfth in the use of telephones.

The above figures indicate that New York farms furnish a very important market for industrial products. It buys more stock feed than any other State. It ranks sixth in the purchase of fertilizers and is exceeded in this respect by only one other northern State.

New York is one of the most important and the most progressive States in agriculture in America. Such decline in farm area and farm population as has taken place has been much more than offset by the greatly increased efficiency of the farmers remaining on the land. Every year marks an increase in efficiency of farm operation. Agricultural education and research are highly important factors in this sustained progress. Both the physical and the commercial interests of the vast populations in New York require the fullest development of the agricultural resources of the Commonwealth.

REPORT OF THE DEAN

VALUE OF 49 FARM PRODUCTS ACCORDING TO THE CENSUS OF 1920

Product	New York	United States	Rank of New York	Approximate fractional part of the total value of the United States production	Percentage that New York value is of total value of the United States production
Cabbage.....	\$ 4,906,249	\$ 21,848,112	1st	1/5	22.5
Carrots.....	450,032	1,563,010	1st	1/4	28.8
Currants.....	597,887	1,421,908	1st	2/5	42.0
Hay.....	169,494,524	2,523,050,224	1st	1/15	6.7
Parsley.....	30,588	107,303	1st	1/4	28.5
Potatoes.....	69,812,321	639,440,521	1st	1/9	10.9
Raspberries.....	2,908,155	11,596,110	1st	1/4	25.1
Salsify.....	2,140	12,386	1st	1/6	17.3
Sweet corn.....	2,028,617	17,297,561	1st	1/8	11.7
Teasles.....	48,420	48,420	1st	All	100.0
Willows.....	26,340	30,180	1st	9/10	87.3
Apples.....	26,548,087	241,573,577	2nd	1/9	11.0
Buckwheat.....	6,242,370	19,715,305	2nd	1/3	31.7
Cauliflower.....	338,040	1,328,415	2nd	1/4	25.4
Celery.....	1,623,684	9,462,477	2nd	1/6	17.2
Dairy products.....	175,695,810	1,481,462,091	2nd	1/8	11.9
Grapes.....	10,673,790	95,586,021	2nd	1/9	11.2
Greenhouse flowers.....	7,238,721	61,892,352	2nd	1/8	11.7
Lettuce.....	1,467,950	8,535,092	2nd	1/6	17.2
Maple sirup and sugar...	3,399,434	12,381,376	2nd	1/4	27.5
Nursery stock.....	2,310,253	20,434,389	2nd	1/9	11.3
Onions, dry.....	2,804,153	21,387,221	2nd	1/8	13.1
Parsnips.....	32,500	244,435	2nd	1/8	13.3
Pears.....	4,026,521	26,439,735	2nd	1/7	15.2
All vegetables.....	22,017,396	193,248,964	2nd	1/9	11.4
Beans, dry.....	3,513,170	61,795,225	3rd	1/18	5.7
Cucumbers.....	821,621	8,579,102	3rd	1/10	9.6
Honey and wax.....	950,832	14,280,153	3rd	1/15	6.7
Kale.....	7,531	241,415	3rd	1/33	3.1
Peas, green.....	968,231	7,164,988	3rd	1/8	13.5
Radishes.....	37,436	437,286	3rd	1/12	8.6
Squash.....	47,098	685,245	3rd	1/15	6.9
Turnips.....	51,739	543,071	3rd	1/10	9.5
Hops.....	535,629	10,364,464	4th	1/20	5.2
Horse-radish.....	12,707	205,767	4th	1/16	6.2
Rhubarb.....	61,592	673,113	4th	1/11	9.2
Cherries.....	750,964	14,166,176	5th	1/20	5.3
Forest products on farms.	19,311,211	394,321,828	5th	1/20	4.9
Greenhouse vegetables...	1,450,604	15,487,878	5th	1/11	9.4
Pumpkins.....	5,568	137,626	5th	1/25	4.0
Tomatoes.....	2,378,858	38,675,496	5th	1/16	6.2
Blackberries.....	376,541	7,117,972	6th	1/20	5.3
Green onions.....	8,010	113,670	6th	1/14	7.0
Spinach.....	93,045	1,715,869	6th	1/20	5.4
Strawberries.....	1,973,304	36,004,245	6th	1/20	5.5
Eggs.....	31,087,581	661,082,803	8th	1/20	4.7
Green peppers.....	41,708	3,079,285	8th	1/72	1.4
Peaches.....	2,840,589	95,569,868	9th	1/33	3.0
Wool and mohair.....	1,977,598	124,006,859	20th	1/63	1.6

Cost to the State of New York of maintaining the State Colleges of Agriculture and Home Economics for the year 1926, reduced to cost per unit of some of the important farm products or farm property

Total cost for one year — \$1,706,823*

	Total number in New York State†	Cost per unit if all charged to this item
All farms.....	188,754	\$9.04
Dairy cattle.....	1,836,900	0.93
Poultry.....	13,408,720	0.13
	Total annual pro- duction in New York	Cost per unit if all charged to this item
Oats, bushels.....	28,829,906	\$0.06
Hay, tons.....	5,720,765	0.30
Potatoes, bushels.....	38,805,641	0.04
Apples, bushels.....	18,459,974	0.09
Milk, gallons.....	741,983,208	0.002
Eggs, dozens.....	87,167,262	0.02

* Total state appropriations for Colleges of Agriculture and Home Economics for all maintenance for resident teaching, research, and extension services in 1926.....	\$1,589,080.00
Average annual appropriation for building and equipment over past 23 years (no appropriation in this item in 1926 or 1925 and only \$5000.00 in 1924).....	117,743.00
Total of these items.....	<u>\$1,706,823.00</u>

† Data from United States Census, 1925.

Some of the funds of the College of Agriculture are used to find new ways and to teach new ways of saving a part of the following annual costs paid by New York farmers. When such savings are made, much more than half of the savings goes to the consumer:

Annual expenditures of farmers for fertilizer.....	\$11,606,671
Annual expenditures of farmers for feedstuffs.....	62,075,138
Annual cost of maintenance of farm equipment.....	42,346,310
Total of three items.....	<u>\$116,028,119</u>

A one and one-half per cent saving on these three items pays the total annual costs of the State Colleges of Agriculture and Home Economics.

Education and labor income in farming

Farm boys of school age who are questioning the advisability of entering or completing high school or college should consider the increased earning power which education gives. It must be admitted that comparative statistical studies of farm labor incomes of persons with varying degrees of education are difficult of exact interpretation. Recognition must be given to the fact that the educational system, from the elementary schools through college, exercises a continuing selective action, eliminating those less qualified to meet its demands and utilize its opportunities. Furthermore, children possessing certain initial advantages, such as a higher degree of native intelligence on the part of themselves or their parents, and those whose parents are financially able to give them some aid in attending school and whose farms are sufficiently near elementary and high schools to encourage attendance, are more likely than others not equally well situated to obtain general or special education in preparation for life work and to succeed in it. Notwithstanding these important qualifications, there appear to be positive relations between the degree of education and farm labor income that are well worth noting. Education is a factor, along with others, in making for larger financial success on the farm.

Farm surveys taken some years ago in different parts of the United States indicate that the labor incomes of farm owners who had attended high school were, on the average, 71 per cent larger than the labor incomes of farmers who had not gone beyond the district school. The farmers who had attended high school owned, on the average, 43 per cent more capital. With equal capital, a comparison of the two groups showed that the high-school farm owners made labor incomes 31 per cent larger in Tompkins County, New York, and 23 per cent larger in Jefferson County, than did the farm owners who had not attended high school.

The scientific and business problems that farmers must solve are more difficult today than they were a generation ago, however; and schools and colleges are now much better prepared to give instruction in agriculture and in agricultural business. Instruction now is of direct assistance in the making of profitable business decisions. While education has been the best investment in the past, it promises even greater returns for the future.

In the cost-accounting work at the State College of Agriculture it has been found that, among the farmers who have cooperated with the College in keeping cost records, those who have taken a twelve-weeks short course at the College have made labor incomes 44 per cent greater, on the average, than have the other cooperators who have received no college training.

Every year, students at the College visit and study approximately thirty of the more profitable farms in western and central New York. Nearly half of these farms are operated by former students of the College. The labor incomes of these former students are twice as large, on the average, as the labor incomes of the other successful farmers visited, while the farm capital averages 28 per cent more on farms operated by former students.

The average labor income made by the former-student group in farming was found to be unusually large. In one of the most prosperous fruit

regions in New York, 1095 labor incomes were taken for the period from 1920 to 1925. Only 14 of these labor incomes, or 1.3 per cent, were as large as the average for the former-student group. In one of the prosperous dairy regions of New York, the College obtained 509 records for the period from 1921 to 1925. Only 8 of these labor incomes, or 1.6 per cent, were as high as the average for the former-student group.

The following tables, from which the foregoing facts are drawn in part, are of further interest as indicating the relation of education to labor incomes in farming:

EDUCATION AND FARM PROFITS AS SHOWN BY FARM SURVEY STUDIES

Area studied and degree of education	Number of farms		Operator's farm capital		Operator's labor income	
	Own-ers	Ten-ants	Own-ers	Ten-ants	Own-ers	Ten-ants
Tompkins County, New York, 1907:*						
District-school education.....	398	113	\$ 4,995	.....	\$318	\$ 407
Beyond district school.....	175	24	6,980	.....	635	473
Livingston County, New York, 1908:						
District-school education.....	239	161	9,059	\$2,837	525	664
Beyond district school.....	117	43	12,982	2,743	662	578
Jefferson County, New York, 1910:						
District-school education.....	235	204	7,381	1,311	454	464
Beyond district school.....	65	48	11,220	1,471	738	630
Indiana, Illinois, and Iowa, 1910:†						
District-school education.....	218	190	27,265	2,188	285	741
Beyond district school.....	55	57	38,552	3,219	675	1,316
Average of above surveys:						
District-school education.....	272	167	12,175	2,112	396	569
Beyond district school.....	103	43	17,434	2,478	678	749
Index numbers:						
District-school education.....	100	100	100	100	100	100
Beyond district school.....	38	26	143	117	171	132

* Warren, G. F., and Livermore, K. C. An agricultural survey, townships of Ithaca, Dryden, Danby, and Lansing. Tompkins County, New York. Cornell Univ. Agr. Exp. Sta., Bul. 295, p. 550. March, 1911.
† Thomson, E. H., and Dixon, H. M. A farm-management survey of three representative areas in Indiana, Illinois, and Iowa. U. S. Dept. Agr., Bul. 41, p. 38. January, 1914.

EDUCATION AND PROFITS AS SHOWN BY RECORDS OF FARMERS KEEPING COST ACCOUNTS WITH THE NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY, 1919 TO 1926

	Former Cornell short-course students	Farmers with no resident college training
Number of accounts.....	67	90
Average labor income.....	\$1,301	\$900

EDUCATION AND PROFITS AS SHOWN BY RECORDS OF ALL THE FARMS STUDIED IN FARM MANAGEMENT COURSE 103, NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY, 1920 TO 1926

	Former Cornell students	Other very successful farmers
Number of records.....	77	106
Average farm capital.....	\$33,189	\$25,813
Average labor income (mean).....	\$4,220	\$1,886
Average labor income (median).....	\$3,628	\$1,548

The state appropriations

For many years the state governmental authorities dealt with the needs of the New York State College of Agriculture with unusual foresight, and, by generous provision for buildings, maintenance, and staff, made it possible for the College to develop with rapidity and to attain a position of leading importance among institutions of its kind in America. This enabled the College not only to serve the needs of farmers in New York in ways which are now reflected in an unusually high utilization of scientific methods in farming and in the conspicuous mental and practical ability of farmers and farm women, but also to become a training center of much national and international recognition. It is a credit and an asset to the State of New York to have its institutions gain wide recognition for their achievements. Every intelligent citizen takes pride in the service which his institutions render to the Nation and to the larger progress of civilization as well as to his immediate personal needs. There is scarcely an agricultural college or experiment station in America which does not have on its staff one or several scientists who received their preparation, in part at least, at the New York State College of Agriculture. The very development which has made this broader service possible has rendered the College of increasing value to the people of the State of New York; and at no time has the College failed to recognize clearly that its primary responsibility is to the agriculture of New York. This is, and must always remain, its first duty and concern.

While the College is properly appreciative of the support which the State has afforded and the evidences of confidence and encouragement which it has always received from the responsible authorities, candor compels the statement that for the past several years foresight and generosity have not been so apparent. The State College has steadily fallen behind in facilities and maintenance. Its salary scale has not been adjusted in accordance with the costs of living since the war, nor has it kept pace with the growing competition for qualified men in agricultural teaching and research. For the past few years salary increases have been generally denied; only in a few instances have the urgent requests been granted. For example, for the entire staff of all grades, professorial, clerical, and operative, the Legislature of 1926 allowed total salary increases of only \$450; and the Legislature of 1927 allowed total salary increases of only \$1640, of which

\$1200 was applicable to the janitor group. Promotions have been made possible for deserving men chiefly by losses from the staff and the opportunity which such losses have afforded for very limited redistribution of funds. The salary scale in the State College is now seriously below that paid in the remainder of Cornell University. In contrast it may be pointed out that, during these years of neglect, the researches and teachings of the college staff have added many millions of dollars to the agricultural wealth and income of the State. Investments in agricultural research and teaching are among the most productive investments which it is possible for the State to make.

The situation is highly acute. The College has no power to protect itself against the demands of other institutions throughout the United States which may desire to draw highly qualified teachers or investigators from its staff. It is equally embarrassed in seeking to fill vacancies. The years of foresight and of great devotion in bringing the New York State College of Agriculture to its present high standing are jeopardized by this policy. There could be no greater shortsightedness than to allow this situation to continue until its disastrous results are accomplished. There is no greater need in the State College of Agriculture than an immediate and adequate advance in salaries; and there is perhaps no action of greater importance which the State can take for the permanent welfare of its agriculture, which is one of its greatest industries and resources and one of its responsibilities.

Of scarcely less importance is the housing situation. The overcrowded and unsuited conditions under which a considerable part of the staff is compelled to work is unworthy of the State of New York. It is unjust to the staff and it is unfair to the student body. It is uneconomical for the State to maintain a staff of highly qualified scientists here, and then to require them, year after year, to work under conditions which lower their efficiency and destroy their enthusiasm for their work. The present staff could serve the State very much more efficiently if they were given even reasonably adequate space and facilities. The College has kept steadily before the responsible authorities of the State the urgent necessity for several new buildings. The continued postponement of affirmative action on these requests in favor of other demands has worked great hardship to this institution and crippled its service to the people of the State. Such a policy is at variance with the policy which enabled the College to rise to a place of eminence and usefulness. It is precisely the policy which will progressively lower New York's standing in education and in agriculture.

The Legislature of 1927 authorized, and the Governor approved, expenditures for the laying of the foundations this year for the imperatively needed plant-industry building. This first step toward relief is profoundly appreciated and opportunity is here taken to express gratitude to the Legislature and the Governor for this enabling act. This building should now be carried to rapid completion, and others for which request has been made should be started without delay. Only by such action can the present well-nigh impossible and neglected situation be adequately rectified.

The fullest consideration of the imperative requirements of the State College of Agriculture is respectfully urged upon the people and the responsible authorities in the State Government. Foresight is the highest

expression of statecraft. Foresight in its actions is the greatest service the State can render for the permanent well-being of its people. The State of New York is fully able to maintain the type of higher institution for agriculture which it really wants to maintain.

Cooperative fellowships and other grants

For many years the College has entered into agreements with farmers' organizations and industrial concerns for the study of special agricultural problems at the expense of the cooperating agencies. In each case the work is usually done by an advanced student, who utilizes the undertaking as his research problem for a higher degree. Occasionally such a grant is received for post-doctorate or other special investigations or services. During the past year the following agreements were entered into:

(a) A temporary investigatorship was provided by Charles Pfizer & Co. Inc., of Brooklyn, New York, for the purpose of studying the usefulness of calcium citrate in the feeding of animals. It carries \$1200 a year for compensation and expenses of the holder.

(b) A temporary fellowship was provided by the American Dry Milk Institute, Inc., for the purpose of promoting the study of the usefulness of dry skim milk in animal feeding. It carries \$1200 a year for compensation and expenses.

(c) The Williamson Cooperative Vegetable Growers' Association, Inc. renewed for a period of two years its temporary fellowship for the study of vegetable-disease problems. This fellowship carries \$1250 a year for compensation and expenses.

(d) Formal agreement was entered into with the New York Cooperative Poultry Certification Association for the maintenance by the College of an inspection service to be utilized by the Association for certifying the production of purebred birds. For the maintenance of the service the Association deposits \$2000 a year.

During the year the General Education Board generously renewed for another three-years period its annual grant of \$10,000 for the further strengthening of the graduate work in rural education and for the support of special studies in rural elementary education and agricultural extension teaching. The grant from this Board, which has been available during the past two years, has been of great value in broadening the scope and intensifying the character of the important research and instruction in rural education which the College has under way.

The Charles Lathrop Pack Research Professorship in Forest Soils

On April 1, 1927, Cornell University received from the Charles Lathrop Pack Forestry Trust a grant for the permanent endowment of a chair in research on the problems of soils in relation to forest production. The capital fund is \$130,000, and the terms of the gift also provide generous additional maintenance funds for a number of years. The trustees have appropriately named the chair the Charles Lathrop Pack Research Professorship in Forest Soils, in recognition of the donor.

This professorship is the first instance of the establishment at Cornell University by private funds of a chair in one of the state colleges. It so

a precedent that may have far-reaching benefits. The contributions that will be made by the chair are to a field of science that heretofore has received no attention in this country and little anywhere in the world; and yet it is a field of outstanding importance to forestry. An exact scientific knowledge of forest soils is the foundation on which must rest the systems of silviculture and forest management that must be developed for American forests. Heretofore most of the research in forestry has been prosecuted by men trained professionally in forestry, especially in silviculture and forest management. The physical and biological sciences, which are the foundation of all scientific work in agriculture, have been brought to bear on the problems of the forest only in minor degree. The next great advances in forestry must come from the employment of these fields of science. The new chair will be concerned with the chemical and the biological problems of forest soils, and it will open up a vast unexplored field of great potential importance. The next decade will doubtless witness a large increase in such fundamental research in forestry. Forest genetics, forest entomology, and forest pathology, among other subjects, offer limitless possibilities for the scientist; and their exploration will mark the most important advance in scientific forestry. Mr. Pack, and his son Captain Arthur Newton Pack, Trustee of the Charles Lathrop Pack Forestry Trust, have shown unusual foresight in determining upon this significant foundation. The University, and the State College of Agriculture in particular, are most fortunate in the opportunity which this endowment affords.

Research in agriculture and forestry has been supported in the United States chiefly on public grants from the States and the Nation. It is a weakness in American philanthropy that these fields, of the greatest public interest and importance, have not generally shared in private benefactions for the promotion of education and research. By this endorsement and his many other great gifts for the advancement of forestry in America, Mr. Pack has pointed a course which may well receive the thoughtful attention of others desiring to use their wealth in productive public service.

The Arnot Forest

The importance of the Department of Forestry in the New York State College of Agriculture to the State and the Nation has received further recognition during the past year. In the spring of 1927 there came to the University, through a gift from the heirs of the estate of the late Matthias H. Arnot, of Elmira, New York, a forest tract of 1750 acres, within twenty miles of Ithaca. The forest is second-growth hardwoods. It is an area typical of the hill country of central and southern New York. It lies as a solid block, and can be reached by automobile over excellent roads in less than an hour from the campus.

The acquisition of an adequate college forest has been the outstanding need of the Department of Forestry. The transfer of the title to Cornell University in fee simple makes possible the realization of long-cherished plans. The Arnot Forest is of value as a laboratory for both professional and nonprofessional students in forestry. As a forest experiment station, it will make possible investigations in many fields of forest research and in closely allied branches. As it is put under systematic forest man-

agement it will serve as a forest demonstration area on a liberal scale. Through the further generosity of the Charles Lathrop Pack Forest Trust, a beginning has been made toward a maintenance fund for the Arnot Forest, for use until such time as the forest itself shall become self-supporting. Additions to the maintenance fund, both for the development of the forest and the field laboratories and for other necessary facilities for research and student instruction therein, is now a pressing need. It is hoped that other private donors will make possible the early development of this forest station.

A permanent summer forestry camp

A third gift to forestry in the State College during the past year is one which very directly increases the effectiveness of the summer camp for professional forestry students. Finch, Pruyn & Co., one of the largest timberland owners in the State, have built for the use of this department a commodious permanent camp on their forest lands at Newcomb, New York. For many years this company has generously received on its properties in the Adirondacks the forestry students from this College for their field instruction. Its holdings are admirably suited to the requirements of such instruction. It has rendered a valuable service to the College and to the State, and this latest evidence of its cooperation is heartily appreciated.

The college staff

Agriculture has had a place in the program of Cornell University from the very outset. This was so not only because the University was founded as a land-grant institution under the Act of 1862, but, as well, because it was in line with the educational ideas shared by the founder of the University and by the first president, both of whom always evinced the greatest interest in the development of agriculture as a field of university instruction. Accordingly, the very first register of the University lists an agricultural-college faculty composed of the President, the Professors of Agricultural Chemistry, Geology, Veterinary Medicine, Botany, and Zoology, a nonresident lecturer in Mechanics Applied to Agriculture, and the Director of the Farm. Twenty years later (1898-99) there were four professors, one assistant professor, and twelve assistants, not counting those in Botany, Veterinary Medicine, and other supporting lines of work. The great expansion both in staff and in students took place after the College had become the New York State College of Agriculture, in 1904, and was given greatly increased facilities by the State for its work. In 1918-19 there were more than 200 members on the staff, 65 of the rank of professor and 57 of the rank of assistant professor. Not all of these were concerned with the instruction of students in agriculture, for, beginning with 1907-08, Home Economics had been introduced as a department of instruction, and from 1914 on there had been rapid development of extension instruction in both agriculture and home economics. From the beginning, research has also been an important function of the College, and it was provided as one of the major activities when the state administration act of the College was passed; and a considerable research staff has been maintained. During 1926-27 there were 273 men and 18 women on the staff of the College.

Agriculture, including the fields of teaching, extension, and research and their administration, but not including Home Economics, which was set off as a separate college in 1925. Of this number, 109 men and 15 women were of the rank of instructor and assistant not doing full-time work as staff members. Reduced to a full-time basis, the staff of the College of Agriculture for the past year would be equivalent to about 220 persons; and a close estimate of their activities indicates that, of their combined total time, 48 per cent is devoted to the instruction of undergraduate and graduate students, 28 per cent to extension, and 24 per cent to research.

As a result of the fact that the largest growth occurred in the decade following the recognition of the College of Agriculture as a state institution in 1904, the staff is at present composed largely of men not beyond middle age who, if they can be retained, will render good service for many years to come.

Of the total number of persons who have ever been employed on the staff of the College, 50 professors and 58 assistant professors are no longer active here; a very few of them have been removed by death, seven remain as professors emeriti, and the great majority are in service in other institutions. The instructors and assistants are of temporary appointment and the changes among them are consequently far greater. Of these groups, 394 have served here and have gone on to other fields of work.

Staff changes

The year has brought a number of important staff changes. Professor A. H. Nehrling, of the Department of Floriculture and Ornamental Horticulture, resigned at the close of the year to go into commercial work in Richmond, Indiana. Extension Assistant Professor Dalton, of the Department of Agronomy, became agriculturist for the Delaware, Lackawanna, and Western Railroad on January 1. Paul R. Young resigned as assistant state leader of junior extension to assume the superintendency of the School Garden Department of the public-school system of Cleveland, Ohio. The Department of Rural Education loses heavily through the resignation of Professors Works and Binzel and Assistant Professor Brownell. Professor Works came to the College in 1914, organized the department, and brought it to its present high development. By his leadership in the work of the department, and as well by numerous public services, he has made an outstanding contribution to this institution and to the cause of education generally. Professor Works entered upon his duties as dean of the newly created Library School in the University of Chicago on July 1. Miss Binzel has accepted a position as personnel director in a large New York business house, and Assistant Professor Brownell has transferred his work to the University of Michigan.

The vacancy in the headship of the Department of Rural Education has been filled by the appointment of Professor Paul J. Kruse to that responsible post. At the same time, Professor R. M. Stewart was appointed Director of the Summer School in Agriculture and Home Economics, both appointments becoming effective on July 1, 1927. Acting Professor Emma Conley, who has taken the place of Professor Binzel during the latter's leave of absence, has fortunately been able to continue her work here for another year.

Among the new appointments is that of Professor Otto Rahn, who will devote the major part of his time to research and advanced teaching in bacteriology, in the Department of Dairy Industry. Dr. Clive McCay is appointed on funds available under the Purnell Act to carry on research in physiological phases of animal nutrition. After serving in a number of western and southern universities, Dr. McCay has just completed his appointment as National Research Council Fellow at Yale University. Dr. Robert W. Nafe comes from Clark University to engage in research in the psychological phases of rural social organization, his appointment also being on Purnell funds. After a period of service at Syracuse University, Herbert B. Hartwig returns to the College as extension assistant professor of agronomy. John Alva Reynolds, a graduate of the class of 1918, assumed the position of assistant state leader of junior extension on April 1.

During the year, Instructors Thomas L. Bayne, Jr., and George Eric Peabody were promoted to assistant professorships in rural education and extension teaching, respectively. Dr. W. H. Burkholder was advanced to a professorship in plant pathology. In the extension staff, Dr. Charles Chupp became professor of plant pathology, Dr. Van Breed Hart became professor of farm management, and W. E. Ayres was appointed assistant professor of dairy industry.

It is a pleasure to acknowledge the stimulating influence of two temporary members of the staff. Dr. Arthur T. Henrici, on leave from the University of Minnesota, contributed much in the way of new methods through his teaching and research in bacteriology; and Dr. W. H. Pear-sall, of the University of Leeds, England, rendered a similar service in botany while exchanging positions with Dr. O. F. Curtis, of our own staff in plant physiology.

During either one or two terms of the year, members of the staff to the number of eighteen were on sabbatic leave, and two others were on leave without salary.

Director R. W. Thatcher

The Legislature of 1923 placed the New York State Agricultural Experiment Station at Geneva under the administration of Cornell University in order to coordinate more effectively the State's agricultural research programs at Geneva and at Ithaca. In furtherance of this object, Dr. R. W. Thatcher, then director of the experiment station at Geneva, was appointed also director of research in the State College of Agriculture. At the close of the past year, Director Thatcher presented his resignation in order to accept the presidency of the Massachusetts Agricultural College, to which he had been elected.

During these years of his joint administration of the experiment stations Dr. Thatcher rendered noteworthy service to the progress of agriculture in this State. His keen and discriminating judgment, his background of successful experience, his broad outlook for agriculture, and his unusual clarity of mind respecting state policies affecting research, made his work highly constructive. His guidance of the research program in the College contributed toward definiteness of work and clearness of objective. While rejoicing with him in the broader opportunity which has called him, we can only count his departure as a loss to the College, to the experiment stations, and to the farmers of the State.

Dick J. Crosby

Dick J. Crosby, Professor in Extension Service, was removed by death on November 15, 1926, following a lingering illness during which he showed great courage and persistence in the work of his office. He was a faithful, competent, and well-beloved member of the staff, whose passing leaves a deep sense of loss.

Professor Crosby was born on a farm in Michigan in 1866. After completing his preliminary education he taught for a time in the rural schools of his State. He later attended the Michigan Agricultural College, where he received both the bachelor's and the master's degree. He remained there for a time as an instructor in English and as editor of the college paper, and then left that position to accept appointment as an assistant in the Office of Experiment Stations in the United States Department of Agriculture. He was later advanced to the headship of the Agricultural Education Service of the Department, in which post he continued until 1913, when he bought a farm in New York. From the farm he came to the New York State College of Agriculture in 1915, to take up work as a specialist in agricultural education and as a professor in extension teaching. His public service had enabled him to travel widely, and he had visited most of the agricultural colleges in the country. His contacts and acquaintanceships among public workers and farmers were correspondingly broad. His knowledge of extension work and methods was uncommonly wide and intimate, and his contribution to the development of the service of the New York State College of Agriculture was noteworthy. He left not only a strengthened organization, but also many printed reports and documents which have continuing value.

Professor Crosby's life was perhaps best characterized by those outstanding qualities which constitute the abiding memories of him among his acquaintances: quiet, strong, utterly faithful and dependable in all that he undertook, a tireless worker, an informed counsellor, a steadfast friend, a devoted servant of the people.

The student body

Since the opening of the University, 8475 students have registered in the four-years course in the College of Agriculture, either as regular or as special students, not counting those still enrolled in the College on June 30, 1927. Of these, 6916 were men and 1559 were women. It was planned from the beginning to admit as special students those who, while qualified to take work of the grade offered, were not able to take the regular course for the baccalaureate degree. Up to the time of the great increase in regular students, or at least up to 1907, the special students were about as numerous as the others; in two of the years there were more special students than regular. The total number of special students up to the present time is 1432. In the later years the number desiring this type of registration has greatly decreased.

Of the total of 8475 persons registered, 1342 may be regarded as having specialized in home economics, though the number cannot be precisely stated because formerly the curricula were not sharply differentiated. When the College of Home Economics was organized in the second term

of 1924-25, its files were begun with the 483 students who were then regarded as specializing within its field. Since then the registrations of the two Colleges have been distinct.

In 1892 the winter courses were added to the college program as practical courses for persons who were not able to take advantage of the longer and more scientific work offered in the four-years course. The winter courses had a higher enrollment than the regular course until 1909-10, and reached their greatest development in 1912-13, when 597 students were in attendance. They have continued since then with a decreasing enrollment, being affected more than the degree course by the financial situation of farmers, by the introduction of agriculture into the secondary schools, and by the expansion of the extension work conducted by the College throughout the farm communities of the State. The total number of individuals who have attended the winter courses from 1892-93 to 1926-27 is 7358, and, of these, 281 have been registered also in the four-years course either before or after attending the winter courses.

The summer school in agriculture, designed chiefly to aid teachers already in service, was begun in 1910. There have been 8068 registrations in the summer school, involving probably more than half that number of individuals.

Of graduate students there have been 3809 registrations up to June 30, 1927, and this may mean from 1500 to 2000 different persons.

The resulting grand total of those who have registered for resident instruction within the College of Agriculture, not counting many short-time schools not mentioned above, is 27,710, representing approximately 21,500 persons.

Of the total number registered, about 70 per cent were residents of New York State, 25 per cent were from other States, and 5 per cent were from foreign countries. Fourteen per cent have come with advanced standing from other colleges. With the large development of colleges of agriculture in other States, the proportion of students from outside of New York has decreased slightly in the later years. In the winter courses, the proportion of students from other States has been somewhat higher than in the regular course. In the case of graduate students, 48 per cent (at least of those receiving degrees) have come from other States, and 15 per cent from foreign countries. There are good reasons why graduate students should go elsewhere than to their local institutions, especially if they have taken their undergraduate work at these colleges. Doubtless the high percentage of students from other States and from foreign countries may be taken as evidence of the reputation which this phase of the work of the College bears throughout the world.

The record of attendance in the College of Agriculture for the past two years is as follows:

	1925-26	1926-27
Freshmen	269	207
Sophomores	175	174
Juniors	160	180
Seniors	161	147
	—————	—————
Special students	765	708
	47	31

Winter-course students:			
Agriculture (general)	62	27	
Dairy Industry	41	22	
Poultry Husbandry	17	14	
Fruit Growing	11	4	
Flower Growing	8	12	
Vegetable Gardening	—	—	
	139	79	
Graduate students	257	272	
Summer-school students	507	648	
	1,715	1,738	
Less number counted twice.....	124	76	
	1,591	1,662	

The Office of Farm Practice of the College takes careful record of the actual farm experience of all entering students. These records indicate that there has been a relative decrease of farm-reared young men entering the College. Of all those entering from 1906 to 1910, 80 per cent were classified as farm-reared. For the group entering from 1913 to 1918, the percentage is 57. Of all those entering during the past three years, 42 per cent are classified as having had little or no farm experience, 31 per cent as farm-reared, and 27 per cent as intermediate, having had more or less farm experience but not having spent their entire lives on farms.

Of all registrants up to 1926-27, 45 per cent have obtained their degrees ; but the total on which this is computed includes the special students not registered for degrees, and the students of home economics who were transferred to a separate college in 1925. Of all regular men registrants up to 1923, numbering more than 5000, 54 per cent completed work for the degree. For men students entering from 1906 to 1910 the proportion of graduates was 75 per cent, while for 1913 to 1918 it was 48.5 per cent; but the war doubtless had some effect in the latter group. Since 1918-19 fully 60 per cent of the entrants have completed their courses.

The records indicate very clearly that, in both the earlier and the later period studied, it is the farm-reared men who stay through more generally to complete the course. Of 666 men entering from 1906 to 1910, 74.6 per cent were graduated ; but the percentage is 86 for the farm-reared men and 60.3 for those without farm experience. The figures for the group entering from 1913 to 1918, affected somewhat by the war, show the same tendency but in greater degree, since 61.8 per cent of the farm-reared men were graduated and but 38.9 per cent of the men without farm experience. This difference is, of course, to be expected, as the men who find themselves unadapted to the work drop out in the earlier years. Of all those who discontinue, 85 per cent do so by the end of the second year.

The proportion of students remaining throughout the course in agriculture compares favorably with that found in other colleges. For the University as a whole, 55 per cent of the 36,488 students registered to June, 1919, received degrees. Doubtless it is to be regarded as part of the function of every college to serve as a selective agency in letting its students

try out their aptitudes. Nevertheless it is of the greatest importance that young people should be brought with as little loss as possible into the channels of training appropriate for them. To that end a closer examination both of applicants for admission and of courses of study must be made. There is in progress also an inquiry of all former students who did not complete the course, as to the reasons for their discontinuance. The College desires thus to establish clearly what functions its teaching should serve and to adapt its resources to those ends.

Careful studies have been made to ascertain the present occupations of different groups of former students. While some of the results of these studies have been published in previous annual reports and elsewhere, it seems worth while to include here a comparative summary. One of its most striking features is the relatively small shift in occupations on the part of farm-reared graduates of the different periods:

Occupation	Non-graduates 85 per cent of whom left in two years or less (per cent)	Special students up to 1924 (per cent)	Winter-course students up to 1924 (per cent)	All men graduates up to 1924 (per cent)	Farm-reared men graduates		
					1910 to 1914	1917 to 1921	1922 to 1925
Farming—farm owners and renters, managers, and hired men.....	19.5	46.2	53.4	24.1	39.3	36.2	34.1
Agricultural business—buying or selling agricultural supplies and products; nurserymen; florists; with farmers' cooperatives; manufacturing and preserving agricultural products; agricultural journalism and advertising, etc..	7.9	11.6	12.4	13.0	9.0	12.1	16.4
Agricultural professions—bacteriologists; entomologists; chemists; foresters; landscape architects; veterinarians; naturalists; etc. (for commercial concerns or in private business).....	3.0	2.6	1.7	7.4	4.5	3.0	1.1
Agricultural teaching, research, and extension—agricultural college and secondary school teachers; experiment station and U. S. D. A. workers; county agents; county club agents; etc.....	4.6	7.9	1.1	27.6	37.1	33.6	35.6
Non-agricultural work—all professional and non-professional men not engaged in work directly connected with some phase of agriculture.....	64.9	31.7	31.4	27.9	10.1	15.1	18.8

During the past year the Graduate School has made an incomplete study of the present occupations of those who received advanced degrees, and the following table has been compiled, including 656 persons now living on whom the doctor's or the master's degree has been conferred. This is an interesting record of the contributions which the College is making in highly specialized training for responsible positions in education and research, both in this country and abroad:

Occupation	Doctor's degree		Master's degree	
	Num-ber	Per-cent	Num-ber	Per-cent
In universities, colleges, experiment stations:				
United States:				
Administrative officers.....	6	2.1	3	0.8
Department heads.....	19	6.6	16	4.4
Professors.....	88	30.4	39	10.7
Associate and assistant professors.....	52	17.9	43	11.8
Instructors and assistants.....	11	3.8	37	10.1
Research staff.....	25	8.6	17	4.6
Research assistants.....	.....	.....	5	1.4
Foreign countries:				
Administrative officers.....	1	0.3	2	0.5
Professors.....	10	3.4	13	3.6
Associate and assistant professors.....	5	1.7	4	1.1
Instructors and assistants.....	.....	.....	5	1.4
Research staff.....	14	4.8	6	1.6
In secondary schools:				
Administrative officers.....	.....	.....	6	1.6
Teachers.....	.....	.....	26	7.1
In United States Department of Agriculture:				
Administrative and research positions.....	15	5.2	15	4.1
In federal, state, and county agricultural research or education:				
United States.....	9	3.1	16	4.4
Foreign.....	2	0.7	.....	.....
In endowed research institutions.....	2	0.7	3	0.8
In commercial research laboratories.....	2	0.7	.....	.....
In agricultural work with commercial concerns....	7	2.4	24	6.5
Farmers, dairymen, florists, etc.....	6	2.1	26	7.1
Miscellaneous agricultural and educational occu-pations.....	7	2.4	20	5.5
Graduate students.....	.....	.....	17	4.6
In non-agricultural, non-educational employment..	9	3.1	23	6.3
Total.....	290	100.0	366	100.0

The following table shows the distribution of students who received advanced degrees in agriculture during the period from 1908-09 to 1926-27 inclusive. Figures as to the present location of 74 who received degrees in 1926-27 are omitted.

State or country	Number from State or country	Number now located in State or country	State or country	Number from State or country	Number now located in State or country
United States:			42. Texas.....	7	8
1. Alabama.....	2	3	43. Utah.....	15	13
2. Arizona.....	.....	2	44. Vermont.....	6	7
3. Arkansas.....	2	4	45. Virginia.....	10	12
4. California.....	11	24	46. Washington.....	11	6
5. Colorado.....	3	4	47. West Virginia....	7	8
6. Connecticut.....	9	11	48. Wisconsin.....	4	5
7. Delaware.....	.....	4	49. Wyoming.....	.....	.....
8. District of Columbia.....	9	28	Other countries:		
9. Florida.....	1	13	50. Argentina.....	.....	1
10. Georgia.....	1	4	51. Australia.....	1	2
11. Idaho.....	6	1	52. Austria.....	.....	1
12. Illinois.....	24	22	53. Canada.....	33	26
13. Indiana.....	21	9	54. Chile.....	.....	1
14. Iowa.....	11	12	55. China.....	38	34
15. Kansas.....	11	8	56. Colombia.....	.....	1
16. Kentucky.....	12	12	57. Costa Rica.....	1	1
17. Louisiana.....	3	5	58. Egypt.....	1	1
18. Maine.....	10	7	59. England.....	2	2
19. Maryland.....	9	5	60. France.....	.....	2
20. Massachusetts....	28	23	61. Greece.....	1	.....
21. Michigan.....	9	16	62. Hayti.....	1	3
22. Minnesota.....	11	10	63. India.....	6	4
23. Mississippi.....	6	6	64. Ireland.....	1	1
24. Missouri.....	21	15	65. Japan.....	6	5
25. Montana.....	2	3	66. Yugoslavia.....	2	1
26. Nebraska.....	7	2	67. New Zealand.....	2	.....
27. Nevada.....	.....	.....	68. Palestine.....	2	1
28. New Hampshire....	8	7	69. Philippine Islands.	11	7
29. New Jersey.....	14	12	70. Porto Rico.....	5	3
30. New Mexico.....	3	3	71. Russia.....	2	.....
31. New York.....	327	217	72. Scotland.....	3	1
32. North Carolina...	16	8	73. Siam.....	.....	1
33. North Dakota...	4	1	74. South Africa.....	21	20
34. Ohio.....	35	22	75. Spain.....	1	.....
35. Oklahoma.....	3	2	76. Sweden.....	2	.....
36. Oregon.....	4	1	77. Switzerland.....	1	.....
37. Pennsylvania.....	57	54	78. Turkey.....	1	2
38. Rhode Island....	1	2	79. Venezuela.....	.....	2
39. South Carolina...	4	6	80. West Africa.....	1	.....
40. South Dakota...	2	1			
41. Tennessee.....	7	8	Total.....	919	779

Summary:

Location known.....	779
Number deceased.....	12
Locations unknown.....	5
Degrees in 1926-27.....	74

Total..... 919

Students either from or to 46 States, the District of Columbia, and 31 foreign countries.

The numbers of students who have received advanced degrees in the various departments of the College since 1908-09 are shown in the table on page 27.

Department	Degree *	Number of degrees given																			Total
		1908-09	1909-10	1910-11	1911-12	1912-13	1913-14	1914-15	1915-16	1916-17	1917-18	1918-19	1919-20	1920-21	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27	
Agricultural Economics and Farm Management	M.S.			3	3	2	6		5	2	1		1	3	5	4	10	6	11	68	
Entomology	Ph.D.						1				1	1	1	5	4	5	7	5	6	37	
Botany†	M.S.	3	3	3	2	5	3	4	3	5		5	5	3	3	3	5	4	13	77	
Plant Breeding	Ph.D.	1	3		1	3	1	1	2	3	10	4	1	6	5	4	9	5	10	69	
Rural Education	M.S.	1	3	2	1	3	2	2	1	3	2	1	1	2	1	4	1	3	3	37	
Ph.D.	M.S.	3	1	2	3	3	3	1				4	1	3	7	4	7	7	4	47	
Pomology	M.B.				4						1	3	3	3	4	8				8	
Ph.D.	Ph.D.	2	3	3	3	2	1	4	1	2	1	2	2	2	1	2	1	1	2	44	
Agromony	M.S.	1		4			1		1	2		1			9	2		1	1	17	
Dairy Industry	Ph.D.	2	1	2	2	1	2	4	2	2		2	1	1	2	3	2	3	3	40	
Plant Pathology	M.S.	3	1	3	2		2	4	2	1	1	3	3	3	1	1	4	5	3	36	
Forestry	Ph.D.						6	3	3	5	3				1	1	2	2	1	39	
Poultry	M.S.	1	1	2	2	2	1	3	6	3	2	3	5	1	6	1	1	2	3	16	
Animal Husbandry	Ph.D.				1		1	1	1	1	2	2	2	2	1	3	2	2	1	13	
Zoology‡	M.S.	3	1					2		1	1						2	1	1	38	
Agricultural Chemistry§	Ph.D.				2	2	1	3	3	5	2				1	1	1	1	3	40	
Floriculture	M.S.				1	1	1	1	1	1		3	5	1	1	3	2	1	1	29	
Vegetable Gardening	Ph.D.				3				1	3	1	1	2	2	2	2	1	3	2	8	
Rural Engineering	M.S.			1						1	1	1			1	1				16	
Rural Social Organization	Ph.D.	1	1	1	2	1	3	1	1		1	1	1	1	2	1	2			10	
Foods and Nutrition	M.S.					1														11	
Household Economics	Ph.D.										3									16	
Child Training	M.S.																			7	
Total																				919	

* Master's degrees were M.S., M.S.A., or M.S. in Agr. All are listed here as M.S., for convenience.
† Botany received support from the College of Agriculture during the school year 1913-14 and since that date.
‡ Zoology received support from the College of Agriculture during the school year 1923-24 and since that date.
§ Agricultural Chemistry was transferred to the College of Arts and Sciences in 1923-24.

The curriculum and the content of instruction

While the early announcements of the offerings of the College give no clear idea of the content of instruction, it is perfectly evident that there was a paucity of teachable material in agricultural science. This is shown by the array of subjects listed as constituting the four-years course in agriculture: algebra, geometry, trigonometry, English, French, German, history, international and constitutional law, bookkeeping, chemistry, physics, mechanics, zoology, physiology, anatomy, botany, geology, astronomy, agricultural chemistry, horticulture, veterinary medicine, agricultural architecture, meteorology, landscape gardening. In 1889-90 there were listed a total of three courses under the heading *Agriculture*, and not more than fifteen others that would fall within the limits of the College as now constituted. There were included Horticulture, given by Professor Bailey, Agricultural Chemistry by Professor Caldwell, Arboriculture by Professor Prentiss, Entomology by Professor Comstock, and Veterinary Science by Professor Law. Professor Roberts was making his great contribution in a course in applied agriculture, supplemented by field work, which included class trips to points of special agricultural interest throughout the State.

Ten years later the number of courses had risen to over thirty. By 1909-10 they numbered over one hundred. During the past year (1926-27), some two hundred and seventy courses were listed. This very great increase in the number of courses is significant mainly as an indication that the organization of the experiment stations, through federal and state aid, and the emphasis placed upon research also by members of the teaching staffs of agricultural colleges, has resulted in a rapid extension of the scientific basis upon which agricultural practices must rest. So great has the accumulation of scientific data become that students can no longer take more than a fraction of what is offered, and the problem of the curriculum has therefore shifted from that of providing adequate and suitable materials for instruction, to one of selection and integration.

The curriculum of the earlier period of the College represented an attempt to give students a knowledge of the best current farm practices and to aid them to understand these in terms of the principles of the underlying sciences, and that has been the central purpose throughout. However, the range of farm-life problems to be submitted to such analysis has vastly increased. It no longer includes simply the immediate problems of crop production. These have themselves increased in number and complexity but there have come to be associated with them in the college program the economic, educational, social, and aesthetic phases of rural life. All of this was clearly enough foreseen by the earlier leaders of the College, and provision has been made for it as rapidly as knowledge advanced and resources were available.

The requirements for graduation have not at any time undergone very radical changes. The following table shows the percentages of time necessarily given to the subjects named under the requirements in force at different periods. An analysis of the work actually taken by students under the present requirements shows that the elective hours (17 per cent in total) are used largely for additional work in agriculture and in science, only 6 per cent of the total being work in other fields:

	English	Science	Economics	Foreign languages	Agriculture	Electives
1885-86.....	5	37	—	8	25	25
1903-04.....	10	34	5	—	30	21
1925-26.....	5	28	4	—	46	17

As at present constituted, the requirements for graduation are meant to provide that students shall take about half of their work in subjects having direct professional or technical application. The sciences to be studied are in turn to be chosen because of their basic importance to these fields of application. The attempt is thus made to work back from the student's professional or vocational objectives to the appropriate means of preparation, but there is much to be done both in helping students to establish their objectives within the general field of agriculture and in determining the elements of training which they need in relation thereto. These are perhaps the most urgent problems in the administration of agricultural education today.

Special meetings and short courses

Aside from the regularly organized courses of resident instruction, the college staff conducts or cooperates in giving each year, at the College, a number of short courses to various special groups. This is an extremely effective service because it reaches persons already at work who know what their needs are. This type of service probably should be enlarged. There are gatherings also of a less formal sort, sometimes including only incidental observation of the work of the College. A record of attendance at these various meetings during the past year follows:

	Attendance
Ninth annual poultry-judging and -breeding school, June 28 to July 3, 1926.....	107
Summer school for town and country pastors, July 12-24, 1926...	121
Broome County Home Bureau picnic, July 16, 1926.....	300
Poultry tour, August 1-11, 1926.....	613
Empire State Forest Products Association, October 7-9, 1926.....	68
New York State League of Women Voters, October 20, 1926.....	97
New York State poultry-production show, November 30 to December 2, 1926 (100 exhibitors, 91 junior-project exhibitors, 1306 birds).....	300
1927 Farmers' Week, February 7-12, 1927.....	5,175
New York State Seed Improvement Association, February 8-10, 1927..... (possibly)	100
Beekeepers' advanced school, January 24-29, 1927.....	64
Short course for county association testers, January 17-29, 1927....	42
Extension school for canners' field men, March 1-4, 1927..... (app.)	50
School for spray-service men, March 21-25, 1927.....	35
Extension conference, annual meeting, March 28 to April 1, 1927...	121
School for grange lecturers, April 11-16, 1927.....	127
International Association of Agricultural Missions, April 22-23, 1927.	75
State Parent-Teachers Association, May 2-6, 1927.....	24
Farmer-railroad conference, June 21, 1927.....	100+
Sixth annual junior field days, June 22-25, 1927.....	1,925
Course for inspectors of Rochester Board of Health, June 22-23, 1927.....	8
Chemung County Farm Bureau tour, June 29, 1927.....	200
Cortland County Farm Bureau tour, June 30, 1927.....	150
Total in special meetings and brief courses at the College....	<u>9,802</u>

Cooperative projects

It has long been an established policy of the State College of Agriculture to cooperate with other state departments and institutions and with federal departments in activities which can best be promoted by joint endeavor. The most widespread cooperation is to be found among the various extension-teaching undertakings. There is, however, a steadily increasing tendency to establish cooperative relations in research problems, particularly with the offices and bureaus of the United States Department of Agriculture. The following incomplete list of cooperative research projects now in force with the United States Department of Agriculture indicates the nature and range of these undertakings:

1. The Department of Animal Husbandry: (a) in cooperation with the Bureau of Dairy Industry, a study of the protein content of dairy feeds (the Department of Agricultural Economics and Farm Management of the College also participating); (b) in cooperation with the Division of Nutrition Investigations, a study of the effects of castration of lambs on the quality of the meat.

2. The Department of Dairy Industry in cooperation with the Bureau of Dairy Industry, a study of the commercial application of improved methods of Swiss-cheese manufacture. The use of pure-culture methods in Swiss-cheese factories in New York has been introduced, with great economic gain to the factories.

3. The Department of Botany in cooperation with the Office of Cereal Investigations of the Bureau of Plant Industry, a series of investigations in the cytology of maize.

4. The Department of Plant Breeding in cooperation with the Office of Cereal Investigations of the Bureau of Plant Industry, research in cereal genetics and breeding.

5. The Department of Pomology in cooperation with the Bureau of Plant Industry: (a) a study of the rate of increase in size of the fruit of several widely distributed varieties of apples; measurements of apples are made at numerous intervals throughout the growing season, in order to determine the relationship between growth and different climatic and seasonal factors; (b) the testing of promising fruit- and nut-bearing plants introduced by the foreign explorers of the United States Department of Agriculture, in order to discover useful new sorts.

6. The Department of Vegetable Gardening in cooperation with the Office of Soil Fertility Investigations of the Bureau of Plant Industry, a study of fertilizers, especially high-analysis fertilizers, for potatoes. The work is done at the Long Island Vegetable Research Farm and in Steuben County.

7. The Department of Agronomy in cooperation with the Bureau of Soils, a soil survey of the State of New York. This is more fully discussed elsewhere in this report. Cooperation of the States with the Federal Government is particularly important in this survey, in order that the various soil types occurring in the different States may be correlated and that the name applied to a particular type of soil and the description of the soil may be uniform wherever this type is found.

8. The Department of Agricultural Economics and Farm Management:
(1) In cooperation with the Bureau of Agricultural Economics: (a)

farm-management studies of poultry farms (the Department of Poultry Husbandry of the College also participating); (b) studies of membership relations in milk-marketing associations; (c) studies of apple production and marketing. (2) In cooperation with the Bureau of Dairy Industry, a study of the feeding of dairy cattle on farms for which the College has farm-management records (the Department of Animal Husbandry of the College also participating). Cooperation is particularly desirable in such studies as those of the farm-management practices on poultry and apple farms, in order that data may be available from competing areas at the same time, on the basis of which the areas can be compared and shifts in production in the competing areas may be forecast.

9. The Department of Rural Social Organization in cooperation with the Division of Farm Population and Rural Life of the Bureau of Agricultural Economics, a study of village population and service agencies in New York.

Other examples of cooperative relations are found in the following:

10. The Office of the Secretary of Agriculture regularly sends to the Editor of Publications of the State College, for circulation, federal news items of especial interest to New York farmers. During the present campaign in five eastern States to eradicate the corn borer, the editors of the five Colleges, in conjunction with the Federal and State Departments of Agriculture, have cooperated in handling the corn-borer news and information service, thus adding to its effectiveness.

11. The Department of Botany, in cooperation with the State Conservation Commission, has given special attention to the plants and plankton in the Oswego drainage basin survey.

12. The Department of Entomology: (1) In cooperation with the State Conservation Commission: (a) biological studies of polluted areas in the Genesee River system, for the purpose of determining the different types of pollution which enter the Genesee River and its tributaries, and the effect of these polluting substances on the fish and other fresh-water organisms in the streams; (b) the biology and control of the white-pine weevil (*Pissodes strobi*). (2) In cooperation with the State Entomologist and other authorities, the preparation and publication of a list of insects of New York. The list records over 16,000 species.

THE DEPARTMENTS OF INSTRUCTION

In the earlier years of the University, when the staff was small in number, there was no clear definition of colleges; and throughout its entire history there has naturally been a great deal of change in the delimitation and in the naming of the fields of instruction. The multiplication of departments was due largely to the increase in the amount of teachable material resulting from agricultural research. The way in which the material was divided among teaching departments was probably due to a variety of circumstances, including, doubtless, the interests and capacities of the men available to carry the work forward. Horticulture and animal husbandry were the first divisions differentiated from general agriculture, and these three and the supporting sciences of entomology, veterinary medicine, and agricultural chemistry were regarded as constituting the College of Agriculture when the colleges of the University were definitely

organized as separate units in 1896. When, in 1904, the College became the New York State College of Agriculture, there were eleven departments: Animal Husbandry, Dairy Industry, Agronomy, Horticulture, Soils, Agricultural Engineering and Architecture, Agricultural Chemistry, Entomology, Rural Economy and Sociology, Outdoor Art, and the Farm Home.

After many changes in details and in relationships, the number of departmental teaching units now stands at nineteen. Animal Husbandry and Dairy Industry have changed little in general scope, except that Poultry Husbandry was set off from Animal Husbandry in 1907. After several shifts, Crops and Soils are now again in one department, Agronomy. Horticulture has been divided into Pomology, Vegetable Gardening, and Floriculture. Entomology has continued from the first, though with great expansion and differentiation within its field. The department is now defined so as to include, besides the more strictly entomological courses, work in limnology, ornithology, fish culture, and parasitology. Agricultural Chemistry has been transferred to the university Department of Chemistry. Of other sciences, Botany has been transferred to the College of Agriculture. Zoology has also been taken in part into the organization of the College of Agriculture. Rural Engineering has occupied much the same field throughout its history. Meteorology, Extension Teaching, and Rural Education were later introductions, the last-named having grown rapidly to be one of the largest of the departments. Forestry was introduced into the University as a separate State College in 1898, being the first forestry school of collegiate grade in the country. After the discontinuance of the State College of Forestry in 1903, forestry work was continued from 1910 on as a department in the College of Agriculture. Perhaps the greatest expansion within a given field has occurred in what was called the Department of Rural Economy and Sociology. This was the forerunner of the present large department which includes Farm Management, Marketing, the History of Agriculture, and Rural Economy in the stricter sense of the public problems of agriculture, such as that of taxation. The social aspects of agriculture introduced into the curriculum as early as 1904, have since 1915 been dealt with by a Department of Rural Social Organization. The Department of Outdoor Life grew with conspicuous success into a school of Landscape Art, which has more recently (1922) been transferred to the College of Architecture except that the division of the department dealing with plant materials has been associated with Floriculture under the departmental name of Floriculture and Ornamental Horticulture.

Just what departments there shall be is one of the questions that are to be regarded as never wholly settled. It is partly a matter of administrative convenience and effectiveness. There is to be considered also the effect which organizational lines have upon the balanced presentation of the subject matter of instruction. Further, the contact with farmers and farmers' organizations, and the distinct major agricultural industries in the State, must not be overlooked. There is advantage in having the departmental units at the College correspond rather closely with the natural divisions of the agricultural industries in the State.

In the pages which follow are given condensed summaries of the reports provided by the heads of the respective departments of instruction. They indicate the development, integration, and needs of the several departments, and some of their more important contributions to the agriculture of the State and to the progress of knowledge through resident teaching, research, and extension service.

Agricultural Economics and Farm Management

Development of the fields of agricultural economics and farm management. When Professor I. P. Roberts came to Cornell University in 1874, one of his first acts was to take an inventory of the farm property. He soon began keeping cost accounts on the college farm. These accounts did not include all of the cost items, but they constituted a beginning in accounting work. Professor Roberts included some farm-management instruction in his lectures on agriculture. The results of his farm-management work are given in his *Farmers' Business Handbook*.

In 1903 Professor T. F. Hunt came to the University. He included some farm-management work in one of his courses in agronomy.

In 1907 Dr. G. F. Warren became assistant professor of farm crops. He included farm-management instruction in one of his courses, and began researches in farm management and in cost accounting. This was the first definite research work in the field of farm management. The results of the research soon became the basis of farm-management teaching. The first important publication was *An Agricultural Survey Tompkins County, New York* (Bulletin 295 of the Cornell University Agricultural Experiment Station). This survey applied statistical methods to the farming business, and it stimulated similar studies in the United States Department of Agriculture and in many of the state colleges. This method, developed by the New York State College of Agriculture, has now been used in hundreds of investigations in America and is beginning to be used in other countries.

From this beginning the research work progressed rapidly, and in 1909 a Department of Farm Management and Farm Crops was organized. In 1911, Farm Management was made a separate department.

A Department of Rural Economy was established in 1903, and throughout its independent existence it was primarily concerned with instruction of students. In 1920 it was combined with the work in farm management in the present Department of Agricultural Economics and Farm Management.

The success of the work in farm management in studying the farm business, together with the growing problems of distribution, led to a desire for similar work in the handling of farm products. Farmers also desired to have agriculturally trained men enter the business of handling farm products and farm supplies. Provision for such work was made by the legislature in 1924. The legislative act called for work in marketing and in agricultural business. Research and instruction in marketing and agricultural business are now a regular part of the departmental program.

The chief divisions of the departmental program at present are farm management, marketing, prices and statistics, agricultural business, history of agriculture, and studies dealing with government relationships to agri-

culture and business operations of rural governments. It is a large organization for a single department, but it has functioned excellently.

Contributions through teaching. The results of this type of work are difficult to measure fully, because one farmer learns from another. One may obtain an idea or a method from the College and pass the information on, so that the source of it becomes unknown. At any meeting of farmers in any county in the State a number of college trained farmers are nearly always present. As the result of twenty years of farm-management teaching, a surprising number of farmers in this State discuss farm management in a manner that clearly indicates the influence of the teaching of the College because they use the terms that were introduced by the College. Many persons believe that New York farmers are much less likely to undertake uneconomic procedures, either in farming, in marketing, or in government, than are those in many other States. The State College of Agriculture has undoubtedly contributed to this result. In fact, the success of the work has constituted a serious problem, in the conferences with individual farmers, groups of farmers, bankers, business men, and others require so much of the time of members of the department. Business organizations and farmers' cooperative associations are constantly seeking to attract members of the departmental staff, and the department has contributed to such agencies a number of men from the staff as well as many from the student body.

Enrollments. The registration in the various courses for the year ending June 30, 1927, was as follows:

Graduate students:

Men who already hold a doctor's degree.....	3
Majors for doctor's degree.....	36
Minors for doctor's degree.....	13
Majors for master's degree.....	15
Minors for master's degree.....	32

Total graduate students.....	104
Foreign countries represented.....	11
States represented	20

Registration by courses, including both graduate and undergraduate:

Summer school, 1926.....	77
Winter course, 1926-27.....	26
Regular term, 1926-27.....	934

Grand total	1,039
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Relations with other departments. If students are to be properly prepared for farming, they must begin with the sciences of crop and animal production and follow with work in farm management, prices, marketing, and the like.

For those who are to go into businesses associated with agriculture it is equally essential that they have such subjects as soils, feeding of animals, and a study of the different individual crops and animals, before they undertake business activities in engineering, handling of fertilizers, feeds and the like. The proportion of the time which such students should devote to the study of marketing, prices, and statistics may be somewhat more than for students who desire to farm.

Students who expect to undertake research or teaching in this field find equally essential to lay a good foundation in the sciences relating to crops and animal production. For example, if one is to study taxation as related to agriculture, he should know chemistry, geology, meteorology, soils, drainage, farm management, and the like, in addition to having specialized in economics. Similarly, if one is to be in charge of a Federal Land Bank, or in the agricultural phases of any kind of banking, he needs to know chemistry, geology, meteorology, soils, and farm management; otherwise he will not know what loans can be made safely. This explains why farmers' cooperatives and business organizations desire agriculturally trained men who, in addition, have been given courses in business; and it explains why graduate students who desire to specialize in agricultural economics wish to come to a university where the agricultural sciences as well as economics are highly developed.

The instruction given by this department is also essential for teachers and investigators in other agricultural fields, as the economic facts must be kept in mind in all agricultural undertakings. In institutions where the economic work is not well developed, the teaching in other departments is often unsound in its economics.

Needs. Studies were begun in the field of transportation some years ago, but were discontinued when the investigator left for another position. These should be taken up again.

At present, one professor is dividing his time between farm finance, farm management, and cooperative marketing. Farm finance and cooperation should each have the full time of one man. It is particularly important that one person should be available to devote his entire time to cooperative marketing.

The coming of good roads, as contrasted with the days when horse-drawn vehicles were the means of conveyance, has caused a vast rearrangement in rural affairs. For example, the country does not need so many milk plants as formerly. Rural government should be thoroughly studied in order to see how best to adapt it to new conditions of transportation and costs. One man should be devoting his full time to this subject.

The materials for the history of New York agriculture are rapidly disappearing. Large amounts of valuable historical material have been destroyed in the past few years because of the rapid adjustments that are taking place in farming. It is very desirable that there be available a man to devote his entire time to investigations and teaching in this field.

Besides the four additional professors suggested above, the major need of the department is for adequate room. At present the department is housed in an old stock-judging barn and in an old poultry feed-house. These buildings are a menace to health, are badly overcrowded, and constitute a very serious fire risk for the many valuable records which the department has assembled.

Agronomy

The development of the department. The Department of Agronomy, in its functions at present, is a product first of division and later of combination. When the New York State College of Agriculture was established at Cornell University, a Department of Agronomy was created for the

first time. It included soil technology, field-crop production and improvement, farm management, and farm mechanics. In 1907 a very complete disruption of the old Department of Agronomy occurred and its various lines of work were divided among a number of newly created departments. These were: (1) Soils, which dealt only with the instructional phase of the subject; (2) Soil Investigations, the functions of which were confined to research; (3) Farm Crops and Farm Management, which, so far as crops were concerned, dealt only with crop production, since crop improvement fell to the lot of the newly created Department of Plant Breeding and (4) Farm Mechanics.

In 1909 the first two of the departments named above were united under the title Soil Technology. In 1912 the Department of Farm Crops and Farm Management underwent further separation into two departments, one of which was concerned with certain aspects of field crops and the other with farm management. In 1921 the Department of Farm Crops was abolished, the duties of that department being divided among the Departments of Plant Breeding, Vegetable Gardening, and Soil Technology, the last-named taking the name of Agronomy. The Department of Plant Breeding conducts all of the experimental work and advanced instruction in crop improvement, but the general course in field crops in the Department of Agronomy provides elementary instruction in that subject. The Department of Agronomy should conduct experiments in the production of field crops, but financial provision has never been made for that purpose and little is being done.

Coordination with other departments. The historical outline given above will help to show the coordination existing between the Department of Agronomy and certain other departments of the College. The knowledge prerequisite to registration in courses of instruction in agronomy indicates the relations to other departments. The varied instruction given by this department requires that students, in accordance with the respective courses which they may desire to elect in this field, must have foundation preparations in general chemistry, qualitative and quantitative chemical analysis, geology, and the technic of general bacteriological methods. Graduate students are likely to take as minor subjects any two of the following: physical, inorganic, organic, or micro-chemistry, bacteriology, plant physiology, glacial geology. For research, training in one or more of these sciences is a necessary preparation.

The relation of soil technology to the study of plant production is too evident to need elaboration. It is through soil management that the greatest increases in crop production have been accomplished. The possibilities of increasing crop yields by means of soil treatment makes its study fundamental in the study and practice of fruit, vegetable, and field-crop production, and it is of increasing interest to foresters.

Contributions through teaching. The rapid developments in agronomy during the past few years have forced a profound change not only in subject matter but in educational viewpoint and procedure as well. While the change is most noticeable in the teaching of soil technology, nevertheless it has also definitely affected the presentation of field-crop subject matter. The educational problems in agronomy which have engaged the greatest attention and effort are those having to do with the proper adjustment

ment of viewpoint and methods to this newly acquired knowledge. Although the proper balancing of the theoretical information and outlook against the practical and applied fields is always a critical educational problem in agriculture, it has been especially acute in agronomy during the past year. Sufficient time beyond that necessary for the ordinary classroom routine should be at the disposal of the teaching staff to keep abreast of the advances in knowledge and viewpoint and to revise the lecture courses and laboratory exercises each year.

The undergraduate courses acquaint the student with the science as well as with the outstanding practical considerations of New York agronomy. The proper adjustment of these courses, one to the other, has been rather difficult in view of the rapid increase in knowledge, and is a problem that must still receive vigorous study.

Students taking all of the undergraduate work offered by the department are usually fitting themselves for the operation of dairy or general farms, for county-agricultural-agent work, or for the teaching of agriculture in high schools or other secondary schools. An effort is made, therefore, to present as much practical information as is consistent with a fundamentally sound scientific viewpoint. When a student wishes to go farther in agronomic science he may do so as a graduate student.

The outstanding features of undergraduate instruction in the department are (1) the excellence of the teaching in the general introductory course in soil technology, and (2) the production of a textbook which, in its three editions, has been more generally used by the agricultural colleges in this country during the past eighteen years than has any other book on the subject.

Two courses in agronomy are offered for winter-course students, one on soil management and the other on the production of field crops. For the time spent, such instruction is probably the most effective teaching effort of the department, since the average winter-course student is earnest and responds readily. Agronomically, it seems highly desirable to expand the winter courses and thus to reach a greater number of prospective New York farmers.

Postgraduate study pursued in the department falls under "edaphics"¹ (the science of the nature and properties of soils in their relation to plant growth) as distinguished from the broader term *agronomy* (which includes the study of both soils and crop plants). If graduate training on the more distinctively crop side is to be attempted, it will take on a broader ecological trend than does edaphics. Thus a study of the vegetation of pastures throughout the State, while based on soil characters, must of necessity include observations on air temperatures and humidity, with probably sunshine and other factors in plant growth.

Graduate work in this department is designed primarily to equip students for research in edaphics and for teaching edaphics in institutions of college grade. Fulfillment of this ideal is indicated to some extent by the follow-

¹"Edaphics." or "edaphology." has the same meaning as "soil science," to which it bears the same relation as does "geology" to "rock science." The advantage of the former term is obvious. Soil technology is not synonymous with soil science. The former embraces the knowledge of the art of managing soil in farming. The science, by definition, excludes the art. The reason for using "soil technology" as descriptive of the undergraduate courses is thus explained.

ing occupational classification of all students who have taken graduate degrees in this department:

	Per cent
College teaching	25
Research	25
Teaching and research.....	25
Agricultural businesses	8
Agricultural extension	7
Non-agricultural	10

Former graduate students of this department now hold important positions in a large number of agricultural colleges and experiment stations. It is one of the important centers in the United States in its field.

Animal Husbandry

The development of the department. The Department of Animal Husbandry had its origin as a department in 1903. Previous to that time the instruction now included in the Departments of Agronomy, Dairy Industry, Animal Husbandry, and Poultry Husbandry was all included in the old Department of Agriculture, although there had been an assistant professor with the title in animal industry and dairy husbandry since 1891. The Department of Animal Husbandry, although having its origin in 1903, was not fully segregated, particularly so far as financial support was concerned, until about 1907 or 1908.

Relations with other departments. Animal Husbandry is closely associated and correlated with several other departments. The department uses the crops grown by the Superintendent of Farms, and in return supplies horse labor to that department and to several others. The demarcation between Animal Husbandry and Dairy Industry is drawn at the point where the milk is secreted. Milk production, and care and maintenance of the dairy herd and of all other livestock, lie in this department. Close correlation exists also between the Department of Animal Husbandry and the Department of Agricultural Economics and Farm Management and of Agronomy.

Contributions through teaching. Three special features of instruction were originated or first put into successful practice in this department: (1) It was the first, or among the first, to give a definite course of instruction in horse training. For several years, until its own stud became large enough, green colts were purchased each fall as material for this class. (2) It was probably also the first to establish a meat laboratory and to provide definite instruction in slaughtering animals and in cutting, curing and marketing meats. This course has now been given for about twelve years and has been eminently successful. (3) It was also among the first to establish, as a part of the instruction in the formulation of rations, a feed laboratory in which, after the student has satisfactorily computed a ration mathematically, he then makes it in miniature from the actual feeds. All of these special features of instruction have been eminently satisfactory and several of them have been introduced into many other agricultural colleges.

The courses of instruction in the department have been arranged with the view of affording theoretical and practical instruction in those lines of

imal husbandry most practiced by the general farmer of New York. In all such courses, it is probable that theoretical instruction rather overbalances the practical, although the latter has been emphasized so far as the means and facilities at hand allow. The proper balance of these two features has been and probably always will remain one of the debatable questions concerning agricultural education.

While the department has always offered graduate instruction and has had a considerable number of graduate students, it has always held the view that graduate instruction, intended to prepare the student for teaching or research, is incidental to the instruction in the department as a whole, and that the best preparation of a graduate for teaching or research should be found in practical experience on a successful livestock farm or in a successful breeding establishment.

Needs. Some of the most essential needs of the department at the present time are: (1) A definite assignment of sufficient land to support the herds and flocks that are essential to practical instruction in animal husbandry, such land not to be invaded for the purposes of any other department. (2) Adequate buildings for the housing of beef cattle, swine, and sheep, and some increase for the needs of dairy cattle. (3) A building that would provide facilities for metabolism experiments for the larger animals. The present facilities are not adequate for such work, and with the extension of the work in animal nutrition and physiological chemistry such provision should be made in the near future. The building should be ample to house a group of at least twenty dairy cows, which could be entirely segregated from the breeding herd, and also should provide quarters for sheep and swine as needed. About \$40,000 to \$50,000 would probably be necessary to erect and equip such a building. It is an immediate need.

Botany

The development of the department. The Department of Botany in the College of Agriculture was established in 1913. Before that time agricultural students took their botanical work in the College of Arts and Sciences. The growth in staff and in lines of instruction has been steady, and now includes most of the larger fields of botanical study. The material equipment has become fairly adequate, with the exception of housing, which is most unsatisfactory. The collections of class material have had rapid growth, and the herbarium now contains about 80,000 specimens.

Contributions. The function of the department is to supply fundamental training in plant study for the more definitely applied branches of the College and for the general needs of the University. The progress of agricultural science has been furthered by the work of this department on rumen inoculation, by its studies of the relation of soil acidity to plant growth and disease, by its significant contributions to the methods of seed culture, and by its truly great contributions to the sum of human knowledge with reference to plants. Its preparation and distribution of cultures for the inoculation of legumes has been an important direct service to farmers.

Needs. The most pressing needs have existed for several years. They are as follows:

(1) The first and most important need is better housing, with adequate fireproof quarters for the collections. The situation has become increasingly difficult each year, and is now very critical. All possible space in Stone Hall has been utilized, and one course of instruction has been held in Fernow Hall for the past two years. This has been unsatisfactory, as the class is at so great a distance from the collections and offices of the department as to make instruction most difficult. No relief has been or can be found for the herbarium, a large part of which is packed away and is therefore unusable, because of lack of space. This is very serious. The old herbarium is still housed at a distance, in Sage College, is almost unavailable for study, and is suffering from neglect. The entire herbarium is subject to fire risks. A good herbarium is of first importance to botany study and the department is in a position to build up the herbarium rapidly when adequate quarters can be obtained.

(2) A second pressing need is for more teachers of the grade of instructor, and for more assistants for research and general work. Increased duties of the professors and increased demands on the department have made it necessary to curtail some of the activities during the past two years. Some high-grade instructors should be added to the staff very soon.

(3) A centralized plant-industry library is one of the most important needs. The plans perfected years ago for the housing of the plant-industry library in the proposed new library building of the College of Agriculture seemed to be the best solution that could be devised for affording this centralization, and the plant departments have looked ahead longingly to the materialization of these plans. The situation as it now exists, with books scattered in various libraries throughout the University and in the offices of various professors, is such as to render work very difficult. Moreover, the decentralization of the library, and especially of the periodical library, removes from the plant-industry group the possibility of consolidation and stimulation of scholarly interest among the graduate students. The library is always the center of research and scholarly work, and when it ceases to be a prominent part of the department the spirit of research and scholarship always tends to deteriorate.

Dairy Industry

The development of the department. Previous to 1891 the instruction given in dairying at Cornell University was limited to a few lectures each year. In that year a professorship in animal industry and dairy husbandry was established, and a three-hour course, given during the first term, covered the care of milk, milk testing, butter making, and cheese making. A part of the course consisted of six three-hour laboratory practices.

The State provided a new dairy building in 1894, and the first twelve weeks dairy short course was then given. This course has since been given annually. It consists of lectures and laboratory practice in milk testing, butter making, and cheese making. The number of students increased each year until there were about 130 in 1917.

In 1898 an assistant was appointed to give instruction in dairy bacteriology, but very few students took work in the course until 1906.

In 1903 the Department of Dairy Industry was established and a professor to head the department was appointed. Courses for regular college students, similar to but broader than those given to short-course students, were arranged.

In 1904 the State provided funds for the construction of a building to house the newly established New York State College of Agriculture. It provided for a new dairy building, which would have increased space for work previously given together with new bacteriological and ice-cream laboratories and a market-milk unit. The building was occupied in 1906. A professor of dairy bacteriology was appointed in that year. Professors in milk testing, market milk, and dairy manufacturing were appointed in the next few years.

The real expansion of the department began in 1906. Between that year and 1917 the number of students increased constantly, until, toward the end of the period, a total of approximately 800 students received instruction in the department in a single year. The resulting demands greatly exceeded the housing and facilities available.

In 1919 a new building was projected, which should provide greatly enlarged space and equipment for the subjects previously taught, and also laboratories and equipment for manufacturing condensed milk, evaporated milk, and milk powder. A commercial unit and refrigeration were provided. The building was occupied in 1923. Later, research professors in dairy chemistry and bacteriology were added to the staff.

The commercial work of the department began with the distribution of market milk from the dairy herd at an early date, and with the sale of products made by students in the different laboratories. When the winter short courses were begun, in 1894, extra milk was purchased throughout the course from near-by producers. Large amounts of butter and cheese were made and sold. As the years passed, the demand for market milk increased until it became impossible to obtain enough milk in the winter, at reasonable prices, to operate the laboratories. This situation forced the department in 1905 to rent a near-by creamery and operate it. The milk supply from that creamery was sent to the department as the requirements of instruction demanded. This practice or a similar one has continued to the present time. The manufactured products had to be sold, and this was the real beginning of the commercial branch of the department.

Since the Department of Dairy Industry had to provide bacteriological laboratories and personnel for its own teaching and research work, it gradually fell to the lot of this department to furnish instruction in general and applied bacteriology for the entire College of Agriculture. The demands for this work have increased to such a point that a complete Division of Bacteriology is now maintained within the department.

That the department has fulfilled the needs of the State in the past is attested by the fact that the graduates of its four-years and winter courses now hold positions in virtually all of the larger dairy companies in the State. Large numbers are employed also in other States; and throughout the commercial dairy world former students are found holding positions of responsibility and trust.

Not only has the department trained men for the practical commercial world, but a number of those who obtained a more highly specialized train-

ing through graduate study are now in positions of leadership in educational and research work.

The members of the department have at the same time been active in research and other forms of productive scholarship. A large number of scientific papers have been published, in addition to innumerable educational articles, reports, and addresses. Sixteen books have been published by members of the department, and most of these have become standard texts in their respective fields.

Relations with other departments. In its market-milk activities, the department with which the Department of Dairy Industry is most closely allied is Animal Husbandry. In certain features of the work these two departments are closely coordinated. For example, the Department of Dairy Industry trains men to test milk and dairy products, and the Department of Animal Husbandry employs and directs some of these men in testing dairy cattle for quantity and quality of production. For its teaching and research, the Department of Animal Husbandry keeps a milking herd of more than fifty cows. The milk produced by this herd is handled by the Department of Dairy Industry, being pasteurized, cooled, bottled, and utilized in the work of the department or sold. In this work close cooperation is necessary. The Department of Animal Husbandry is interested primarily in the quantity and the chemical quality of the milk produced, while the Department of Dairy Industry is interested primarily in the cleanliness of the product as well as its chemical composition. Both are vitally interested in the subject of the tuberculin test, one from the standpoint of its protection to the health of cattle, and the other from the standpoint of the protection of the community. Many other instances might be cited which show the common interests of the two departments.

In work which involves problems in sanitation, food values, economics, and marketing, this department correlates its activities with those of the Veterinary College, the College of Home Economics, and the Department of Agricultural Economics and Farm Management.

The Department of Rural Engineering is being called upon more and more to assist in giving advice regarding the construction of dairy barns and milk houses, and for aid in connection with dairy-plant equipment. In this work the Department of Dairy Industry lends its aid along the line of sanitation and in other technical details.

The work of this department which deals with milk products and dairy manufacturing is not so closely related to the other departments of the College, and this work constitutes one of the principal reasons for the existence of a separate departmental organization for dairy work. In this phase of its work the department is more closely related to the activities of the divisions of agricultural and sanitary chemistry in the university Department of Chemistry than to the other departments of this College.

The Division of Bacteriology in the Department of Dairy Industry serves the needs not only of its own department for training students in bacteriology, but also of students of agronomy, botany, plant pathology, general biology, and several other lines in agriculture, who require instruction in bacteriology. Some instruction is also afforded students from the Colleges of Home Economics, Medicine, and Arts and Sciences.

The year 1926-27. The year 1926-27 has marked considerable progress in the evolution of the Department of Dairy Industry and its activities. For a number of years there was an increasing tendency among dairy departments of American agricultural colleges to become commercial organizations, whose teaching was largely confined to practical subjects and whose extension activities were concerned almost wholly with elementary aid given to needy units in the industry. This was a natural development because of the fact that it has been necessary for each college to maintain a producing dairy herd and a commercial factory in order to meet the teaching and research needs of the institution. Also, there was such a demand for practically trained men, with only a somewhat elementary scientific background, that vocational training for dairy work was a necessity.

But the times are rapidly changing in the dairy world. The old one-man dairy plant is largely a thing of the past, and the industry is rapidly moving in the direction of larger units and more scientific control. The more progressive units in the industry are no longer greatly interested in vocationally trained men, except for minor positions; they are rather seeking persons who are more fundamentally trained and who have the knowledge and ability to solve problems which are highly technical and scientific in nature.

This department has recognized the changed state of affairs in the industry, and has been seeking for the past several years to strengthen its teaching on the scientific side and to broaden its research activities in the direction of more fundamental work. With this has come a subordination of its commercial activities to the more strictly educational and research work of the department.

The personnel of the department has been greatly strengthened during the year by the addition of Dr. Otto Rahn, recently head of the Department of Physics in the National Dairy Research Institute at Kiel, Germany. Dr. Rahn formerly spent seven years in the United States at the Michigan State College of Agriculture and the University of Illinois, where he achieved distinction as a bacteriologist. Since the war he has been engaged in physical and chemical studies of milk and dairy products at Kiel, during which time he became recognized as one of the leading dairy scientists of Europe. In this department Dr. Rahn will devote the major part of his time to research and advanced teaching in the field of bacteriology.

The department has been fortunate in having also on its staff, for the year, Dr. A. T. Henrici, of the University of Minnesota, who has been on sabbatic leave from his own institution. Dr. Henrici holds an outstanding and unique position in the bacteriological world, and this department has gained much in the way of new methods and ideas through his teaching and research activities during this period.

The instruction in dairy industry has been strengthened by a reorganization of the advanced courses so that the material is presented more from the scientific point of view. This has been aided greatly by the addition of an advanced course in dairy chemistry.

There was a small increase in the number of students taking advanced work in dairy industry during the past year. The number of students taking work in bacteriology continues to increase, and during the year the lab-

oratory facilities were taxed to their limit. The demand for additional work in bacteriology has necessitated the development of several advanced courses in this subject.

The winter course in dairy industry again proved a marked success. While the total number of winter-course students decreased, the number electing the special course in dairy industry amounted to more than 25 per cent of the entire number in the College.

Entomology and Limnology

The development and service of the department. The Department of Entomology and Limnology at Cornell University grew out of the work of Professor John Henry Comstock, who initiated in this country the teaching of entomology in college courses. His was the first department devoted to that subject. For many years he, with two instructors, constituted the staff of the department, while the subject "Agriculture" was only another department of the University.

Upon the organization of the State College of Agriculture, with its larger demands, came the expansion of both basic sciences and applied subjects. More courses were offered, both advanced and specialized, and the staff was increased to take care of the rapidly growing body of students. A course in general biology became a necessity; courses in parasitology, limnology, and agriculture were added; a biological field station and an experimental fish-hatching station were built. Later, courses in apiculture were added, an apiary was established, and the work in vertebrate zoology which had remained apart was recombined into this one department.

The department has steadfastly maintained two aims: to add to the sum of human knowledge, and to aid in giving that knowledge practical application.

On the research side there has been cooperation with nearly every department in the College. On the applied side, from the very nature of the work cooperation has been especially close with a few departments: with the Department of Plant Pathology in the study of pests affecting growing crops; with the Departments of Animal Husbandry and Poultry Husbandry in the study of pests of domestic animals; with the Department (now College) of Home Economics in the development of methods of control of household insects. These are the principal lines of service to the people. Lesser groups of producers are served by the work in apiculture and in aquiculture.

Needs. The department has long been handicapped by reason of inadequate maintenance funds. It suffers also from excessive overcrowding in wholly unsuited quarters. Quite as serious is the lack of funds for publications. There is no greater discouragement to productive research than failure of means of publication when results have been attained. The continued maintenance of the excellent work of this department calls for more ample quarters and a substantially increased operating budget.

Floriculture and Ornamental Horticulture

The development of the department. The Department of Floriculture was organized in 1913, when the older Department of Horticulture was separated into fields of specialized work. The organization as then

lished was maintained until July 1, 1922, when the Department of Landscape Art was discontinued in the College of Agriculture and the work in landscape design was transferred to the College of Architecture.

work in ornamental woody plants, their identification and values in landscape planting, and plant propagation and other factors in nursery management, and the extension work in beautifying rural public properties, came to this department, the title of which was then changed to the Department of Floriculture and Ornamental Horticulture.

Relations with other departments. The departmental work is closely related to the departments of pure science in the University. Chemistry and geology are both essential for students of plant life, as are all the environmental factors which influence normal plant growth. A knowledge of botany, especially plant physiology, is fundamental, and a thorough knowledge of the properties of soils and the effect of different types of soils on plant growth is indispensable, especially under the intensive system of growing plants under glass. The work of the Departments of Zoology and Plant Pathology are equally valuable, as the florist must know how to protect his plants. With the increase in production, and the resulting competition which has developed in the disposal of products grown in nurseries and greenhouse establishments, courses in cost accounting, marketing, transportation, business law, and money and banking have become important in the curriculum of the department.

Contributions through teaching. The contributions of the department are seen in the production of ornamental nursery stock and the growing of potted plants and cut flowers under glass. An important contribution to the general rural welfare of the State is found in the work of beautifying rural community centers by plantings of ornamental shrubs and trees about rural churches, schools, libraries, and other public buildings, accomplished through the extension service. The demand for such assistance is much greater than can be granted by the single extension worker available.

The department has contributed much to the progress of education in its field by the training of teachers now employed at many agricultural colleges and secondary schools. Graduates of this institution head departments of agriculture or ornamental horticulture in Massachusetts, Connecticut, Pennsylvania, Maryland, Ohio, Michigan, Iowa, and Kansas, while others are engaged in varied lines of research in state and federal experiment stations. Furthermore, persons who specialized in floriculture and ornamental horticulture at the New York State College of Agriculture are now engaged in practical work in nearly every State in the Union.

The enrollment in the department has been steadily growing. In the regular undergraduate courses, 100 more students were enrolled in 1926-27 than in 1925-26. In addition, the number of postgraduate students specializing in the department increased from two to six; and the registrants in both the winter course and the summer school were in excess of those for preceding years.

Teaching and research must be based on practical experience, or else the scientific worker will be lost when he comes into intimate touch with the problems of the commercial florist or nurseryman. Hence it is that the required forty weeks of practical experience at some approved commercial establishment has been found of great value.

Needs. More financial support for research work on the propagation of nursery stock is imperative. Since Quarantine 37 has debarred importation many species of plants heretofore propagated in European countries, it has become necessary for American nurserymen to grow practically all types of ornamental plants. Changed environmental and climatic conditions, and especially changed labor conditions, have presented serious problems in producing plants at prices which make it possible for the average American to purchase such stock. This is particularly true of many types of bulbous plants, such as narcissi, and other ornamental species which are difficult to propagate, such as azaleas, rhododendrons, and many of the evergreens. As the nursery interests in New York are among the most extensive in the United States, it is particularly necessary that greater activity in research on these problems should be developed. A small beginning has been made in this work, which has received enthusiastic endorsement from the nurserymen not only of New York but of other States as well; but no funds are available for its continuance.

The demands for extension service in landscaping rural public properties have been much greater than the College can meet with its single worker. A trained assistant in extension service is greatly needed.

The present instruction given by the department seems to be satisfactory except in two respects. The first and most important is that there is inadequate instruction in the landscaping of small properties. Interest in home-ground improvement is increasing rapidly, and fully 75 per cent of the nursery stock used in this improvement is sold by nurserymen direct to small-home owners. The professional landscape architects are not handling this increasing volume of small landscape jobs, and they do not want to handle it. The nurserymen of the State, through their executive committee, have asked the department to provide better instruction in landscape design, especially as it applies to this very definite small-property problem. Some of these nurserymen have sons studying in the department, and many of them have businesses which can use many more men of this kind if they are trained properly in good landscape design for small properties.

The second addition which should be made is sound and practical instruction in tree surgery. The Departments of Forestry and Plant Pathology also are interested in this line of work and are concerned in its establishment.

The department needs greatly to strengthen its research on problems of production of cut flowers and potted plants grown under glass, and of production of nursery plants out-of-doors. Each of these phases should be in the hands of a specialist. These men should be available to visit florists and nurserymen and aid in the solution of their pressing problems, as well as to conduct investigations at the College.

Forestry

The development of the department. Cornell University has an important place in the development of forestry in the United States. Here in 1898 was established the first school of collegiate grade in North America for the training of men for the practice of forestry as a profession. The New York State College of Forestry at Cornell University was the first instance of a commonwealth's starting an institution of collegiate rank.

advance education and research in forestry, a science and profession which is of paramount importance to the whole body of the people. The curriculum worked out for that college later became the basis of the standardized curriculum for professional instruction in forestry on which, in the revisions made from time to time, have been patterned the curriculum of all the leading forest schools in this country and Canada for the past twenty years. At Cornell was started in 1902 the *Forestry Quarterly*, now the *Journal of Forestry*, the technical periodical of the profession of forestry in America and the organ of the Society of American Foresters; and from that college came books that still hold their places as recognized authorities in the field of forestry. The old New York State College of Forestry at Cornell University was, most unfortunately, discontinued in 1903, but the influences that were set in motion still continue to manifest. When the State's building for forestry here was dedicated in May, 1914, it was the first building erected at any institution of learning in the United States for the specific housing of forestry classrooms and laboratories.

The present Department of Forestry in the New York State College of Agriculture at Cornell University dates from 1910. It stands as one of the essential units in a College that deals with agriculture in its broadest applications. From its staff have come contributions to the growing list of books dealing with various of the technical aspects of forestry, as well as constructive participation in numerous movements which have had to do with the shaping of forest policies, both federal and state. The Department of Forestry in the State College of Agriculture occupies an important place among forest schools of the United States.

Contributions through teaching. The chief interest of the department has been in the training of prospective farm managers in the care of woodlands, in the professional education of men for the practice of forestry, and in the development of extension work in forestry as a part of the State's agricultural-extension program. In the sixteen years from 1911 to 1927, inclusive, many hundreds of agricultural students have received instruction here. At the same time and with the same staff and facilities, 101 students have been graduated with the bachelor's degree upon completion of the undergraduate professional course in forestry, and 51 other students, registered in the Graduate School, have received the degree of master in forestry. The records of the department for 101 of these shows the following percentage distribution of their professional services in forestry:

Service	Degree of M. F.		Degree of B. S.		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Federal work.....	10	27.77	9	13.84	19	18.81
State work.....	5	13.86	8	12.31	13	12.87
Private work.....	12	33.34	42	64.61	54	53.46
Teaching.....	6	16.72	3	4.62	9	8.92
Postgraduate study.....	1	2.77	3	4.62	4	3.96
Work in foreign country.....	2	5.54	0	0.00	2	1.98
Total.....	36	100.00	65	100.00	101	100.00

At the present time three state foresters are graduates of this department, several graduates hold professorial positions in recognized colleges, and many have been or now are in responsible positions in the research work of the United States Forest Service.

One of the basic needs of every highly developed modern nation is an assured supply of wood. The forest is the only source of timber, of wood, and of other forest products in commercial quantities. Continuous production in perpetuity is the primary purpose of forestry. To realize this objective forestry becomes at once a field of science, an art, and a business. Proper forest management depends on a correct understanding of the natural laws governing the growth of trees and forests, as well as on economic factors. The natural sciences provide the bases for this understanding. In the application of the principles so revealed lies the art of forestry; and in the handling and profitable disposal of the products lie the business aspects. In addition to making direct returns, forests also serve man in other well-known ways, as in the modification of stream flow and in the utilization of land otherwise unavailable for productive purposes, recreation grounds, and the like.

There is demand in the profession of forestry for men of varied qualifications, aptitudes, and degrees of training. The forest experiment stations have constant need of foresters who are qualified for research. Attractive opportunities await those whose interests lie in forest pathology and forest entomology, fields of rapidly increasing importance. Teaching posts make a constant demand, and forestry extension service is now rapidly opening up in many States. For those whose inclinations lie in administration, several broad fields are open. The United States Forest Service and the forestry departments of the individual States offer opportunities to those who desire to enter the civil service. In the industrial field, as in the pulp and paper industry, the lumber industry, the wood-preserving industry, useful careers are open to qualified men. The strong development in allied branches in the State College of Agriculture enables the Department of Forestry to prepare students for many of these specialized fields, as well as to serve the immediate needs of farmers, with almost negligible additional expense to the State.

Needs. The time has arrived when an additional extension instructor in forestry is needed. From the beginning this department has played an important part in the extension work of the College, and the cumulative effects of its work are evident in the present widespread interest in the establishment of local forests and the improvement of farm woodlots. This is a development of highest importance in this State, and the present momentum should be maintained or further stimulated. Additional assistance in the extension work is required if this is to be done.

It is not the desire of the department to increase its staff materially. But there is one major line of work that waits still to be provided as an integral part of its organization. There is needed a research assistant professor in that phase of forest utilization which deals with the best methods of removing forest products from forest tracts of limited size, such as farm woodlots and woodlands. The more complete use of the felled tree and the prevention of waste in the operations in the woods present real problems. Another field for which assistance is needed concerns the mar-

keting and use of timber and wood grown in farm forests. Since the income determines the methods that the farmer will use in harvesting his forest crops, it becomes important that he should know how to market and utilize his wood.

Meteorology

The Department of Meteorology is one of the younger departments of the College, and is said to be the first Department of Meteorology to be established in a land-grant college. It was organized in 1912 by Dr. Wilford M. Wilson, who was the first professor of meteorology in an agricultural college.

The primary activity of the department has been, and still is, that of classroom instruction for agricultural students. The department cooperates with other departments of the College in many ways, chief of which is in the supplying of weather and climatic data for various sections of the State and the United States.

There is a growing need for research along the lines of meteorology and climatology in relation to agriculture, but with the very limited staff of the department—a professor and his assistant—it has been impossible to accomplish anything in this direction. A few of the many problems that might be studied with profit include the correlation of weather and crop production, the effect of temperature, rainfall, and sunshine on plant development, comparative climatology, and the climatic distribution of certain crops. It will be an advantage to the State when provision is made for investigations of such character. The atmospheric environmental factors in agriculture have been too long neglected. There is reason to suppose that important advances await fuller knowledge in this field. The College would welcome a small appropriation from the State to inaugurate researches in this domain.

Plant Breeding

The development of the department. The Department of Plant Breeding was established on April 1, 1907, under the direction of Dr. H. J. Webber, who left the Bureau of Plant Industry of the United States Department of Agriculture to organize this work. Dr. Webber, because of his work with cotton, tobacco, citrus fruits, pineapples, and corn, was recognized as one of the outstanding men in plant breeding in America, and he brought a rich experience to the department.

The name of the department, as then organized, was Experimental Plant Biology, it being understood that the major emphasis would be placed on plant breeding. Later the name of the department was changed to its present title. It was the first separate department devoted to plant breeding to be organized in any institution in America.

The department was organized for research and graduate study, and it was contemplated that the fundamentals of variation and heredity should be stressed and the studies used to train a few graduate students. While research studies were to be given prominence, the practical phases of the subject were not to be neglected. This freedom of choice of problems has meant much to the vigor and development of the department. It was early recognized that, while the study of the problems of heredity was of great importance, the application of the principles of breeding to the service of

humanity was of even greater importance, and as a result practical plant improvement has been given its proper place from the outset.

Soon after the department began to function, certain formal courses in the principles and methods of plant breeding were organized. It was also soon evident that, in order to get the results of plant-improvement work to the growers, extension teaching and demonstration activities would be necessary and desirable, and such work was inaugurated in 1911. From that time onward, the work of the department has steadily progressed, with emphasis always placed on the problems of fundamental nature, but at the same time with attention given to the teaching and extension phases of the work.

The next important advance came in 1914, when, with the appointment of Dr. R. A. Emerson, of Nebraska, as head of the department, there were added the valuable corn investigations which Dr. Emerson had prosecuted for several years and which have since become one of the major lines of the department. The work along all lines expanded rather rapidly in the succeeding years. The research was enlarged and the practical plant improvement work was increased. The extension service in the promotion of better seeds created considerable interest among growers, which resulted in a heavy demand for improved seed. The teaching, both graduate and undergraduate, received greater attention, so that the students were given better training in the fundamentals of genetics.

In 1921, on the dissolution of the Department of Farm Crops, the pasture-improvement work and the experiments with silage crops were added to the activities of the Department of Plant Breeding.

An important subsidiary development in the department is the Synapse Club, which is an organization of graduate students and members of the staff for the purpose of developing and broadening the students' interests. It has served to promote the educational aims of the department, and at the same time to inculcate in students the ideals of useful public service.

Relations with other departments. While the researches are limited almost exclusively to plant materials, the instruction makes use of both plant and animal materials for illustrative purposes, and thus is related to the Departments of Botany and Zoology. Furthermore, the teaching concerns the field of genetics, not plant genetics alone. Many students specializing in poultry or animal husbandry and in certain of the social sciences find it desirable to have this work as a part of their foundation in science. For the courses offered in this department, a fundamental knowledge of cytology, physiology, and mathematics is required. The instruction is therefore more or less related to the departments of botany, zoology, poultry and animal husbandry, mathematics, and the social sciences.

Since the researches are limited almost entirely to plant materials, the work is closely related to the Departments of Botany, Plant Pathology, and Vegetable Gardening. With these three departments rather close cooperation exists in connection with several projects. There is also some informal cooperation with the Departments of Zoology and Entomology. Graduate students in plant breeding usually elect minor studies in one or more of the above-named departments, while students from the latter often elect a minor in plant breeding. It is not unusual for graduate students in poultry or animal husbandry to elect minors in plant breeding. Thus the

research and graduate work is rather closely related to most of the specialized departments in the general field of biology and to poultry and animal husbandry.

Contributions through teaching. The educational work of the department has two phases: the formal instruction of students, and the more informal instruction given in connection with the thesis problems of graduate students.

The beginning course in genetics is designed to give the student a working knowledge of genetical principles as a basis for: (1) further work in subject of genetics, (2) applied work in plant or animal breeding, (3) understanding of the factors underlying the betterment of the human race, and (4) a distinct point of view toward biological problems and toward life in general. Of recent years this course and the advanced course in genetics have been recognized by the College of Arts and Sciences as the science work, and accepted by that College as work in the Department of Animal Biology. These courses are therefore used by students of the Arts College in satisfying some of the requirements for the A. B. degree.

It is also encouraging to note that students preparing for medicine are beginning to elect genetics in greater numbers.

Within the past five years the course has been strengthened by the preparation of numerous problems, outlines, and special helps of a similar nature, and by the building-up of an excellent collection of laboratory materials. The laboratory specimens of corn, wheat, and oat hybrids are now being supplemented by a collection of rabbit pelts to show inheritance in mammals. In addition to these things there are the various races of the fruit fly, *Drosophila*, with which the students conduct breeding investigations, and a small collection of live mice which can be used for genetical studies by students who are qualified to undertake the work and sufficiently interested to do so.

The advanced course in theoretical genetics is designed to meet the needs of the research man and the specialist. An attempt is made to acquaint the students with the various tools of the investigator in genetics, and to give him practice in their application. Original research problems with *Drosophila* and with theoretical data are used for this purpose. The student is given a preliminary training in research methods and practice in the critical evaluation of scientific beliefs and the evidence upon which they are founded. Most of the students of this course are going out to positions of responsibility in colleges and experiment stations in this country and in foreign lands. In this course it is necessary to do a great deal of work individually with the students.

In the course of methods an application is made of the principles of genetics to the improvement of crops. A study is made of methods of food-seed production and of the results of plant-breeding activities at this and other experiment stations. Some of the students taking this course are preparing to go into the seed business, others into seed growing, others to county-agent and similar work, and still others into plant-breeding work at experiment stations.

The instruction in biometry aims to give the student a thorough general knowledge of the methods used in studying variation, correlation, and

curve fitting, and to teach him how to interpret the results obtained by these methods. Considerable emphasis is laid on the probable-error concept and its application in planning and interpreting results.

The informal instruction of graduate students takes more or less of the time of each member of the staff. The outlining of a thesis problem, with the planning of methods of attack upon it, the investigation of an original problem as undertaken by all of the major doctorate students of this department and the writing-up and publishing of the results of such an investigation, all call for frequent conferences of the student with his committeeman; but their published results constitute many valuable contributions to agricultural science and to agricultural practice.

Another phase of the educational work of this department is in connection with the famine-relief program in China. This is the result of a cooperative agreement between the University of Nanking, the New York State College of Agriculture, and the International Education Board. The agreement provides that each year, for a period of five years, one of the professors from this department shall spend a part of his sabbatical leave in China to direct the project without additional cost to the College. The enterprise has a twofold purpose: first, to organize the plant-breeding work at Nanking and the cooperating stations on a comprehensive scale and to work out methods of crop breeding applicable to local conditions; and second, to train workers in these methods so that they may continue the work independently of outside aid. Much is being done through cooperation with institutions in other parts of China. There are at present working agreements with seven institutions in different parts of China and there are prospects that others will come in.

The work was begun in 1925 with wheat, barley, rice, soybeans, kaoliang, and corn. In the beginning some 30,000 plants were selected for further breeding. Special methods are being worked out for use with corn and kaoliang.

Of particular importance in connection with this work is the Institute of Plant Improvement held from about the middle of July until the end of the first week in August, at the University of Nanking. The man in charge of this department has assisted there in the training of experiment-station workers, and more especially in bringing to them a knowledge of newer methods in agricultural experimentation.

The extensive scale upon which this work has been organized and the wide range over which its influence is exerted, should have a far-reaching effect, not only upon the work of producing better crops for China, but in the training of the Chinese to improve their own crops.

Needs. Aside from the prevailing necessity for a higher salary scale, the department is in need of more funds for maintenance. There is an urgent need also for an assistant in extension work, of the same type as the research assistants. One such permanent addition to the extension staff would relieve the professorial staff of much routine and manual work, thus liberating time for more productive efforts. It would constitute an economy.

In the way of facilities, the most urgent necessity is for an increase of approximately 50 per cent in greenhouse space. The long time required to grow several generations of plants is a serious difficulty for graduate

tudents in genetics. The possibility of growing in a greenhouse even a relatively small number of plants during winter often results in saving a year of the limited time of graduate students. Such students must be encouraged, as they constitute the source from which the future teachers and investigators in agriculture are to be drawn.

Plant Pathology

The development and interrelations of the department. The Department of Plant Pathology was established in 1907, and has the distinction of being the first separate department devoted to this applied phase of botany at any institution in the United States. The economic importance to be assigned to diseases and disease control in the field of agriculture was already thoroughly established by the earlier work of investigators at the state and federal institutions. Since the majority of known plant diseases are caused by fungi, it was logical that the mycologist, or student of the fungi, should be our first pathologist; and with one of the foremost mycologists in this country on the staff at the State College of Agriculture it was equally logical that this institution should have played an important part in the development of the subject.

Work of a mycological nature was prominent in the early years of the development of the science of plant pathology here as well as at other institutions, and all of the mycology instruction in the university came logically to center in this department. However, the fact that pathology relates more especially to plant physiology was early recognized and leadership assumed in the proper shaping of the science, both in teaching and in research. Problems in physiology are really problems in chemistry. In the breeding of plants for resistance, the study of abnormal histology, the employment of fungicides, the rôle of insect vectors, and the study of the effect on the plant of insect and plant cohabitation, the relation of plant pathology to genetics, histology, chemistry, and entomology is indicated. The importance of bacteriology to the pathologist is evident from the fact that plant diseases caused by bacteria number several hundred—a greater number than is known in the field of medicine. The abnormal or diseased condition can be adequately studied only by workers who have full appreciation of the normal functions and structures of the plant. For such knowledge we are dependent upon advances in the fields of botany dealing with the normal plant. Strength in plant pathology, then, is dependent upon strength in the primary sciences—mathematics, physics, and chemistry—and in the secondary sciences—botany, genetics, zoology, geology, meteorology, and economics.

From a staff consisting of two workers, and a total amount for salaries and maintenance of \$3600, in 1907-08, the department has increased in twenty years to a scientific staff of twenty-five, and it administers state, federal, and private funds totaling approximately \$80,000. To the layman this may appear to be an unusual development and difficult to understand. When it is realized, however, that plant diseases annually rob the farmers of the State of about one-fourth (8,000,000 bushels in 1924) of the apple crop, almost one-third (more than 21,000,000 bushels in 1924) of the potato crop, one-twelfth (almost 3,000,000 bushels in 1924) of the

oat crop, and similar amounts of our other important crops, it must be evident that the State is warranted in making a relatively large investment for developing disease-control measures. Most of the plant diseases are controllable, and a much larger staff could be used to advantage in reducing losses from diseases, with great economy to the State and to farmers.

Contributions. Some of the chief contributions to the field of plant pathology made by this department are as follows:

(1) The introduction and development of the extension-specialist idea in plant pathology. Professor Barrus was the first extension plant pathologist in an American university, and it is probably a true assertion that in no other State has the extension work in disease control been of greater help to farmers than in New York. An effective organization has been developed and material progress has been made in the education of farmers in proper methods of preventing losses from diseases. The special field-assistant work, mentioned elsewhere, is cited as an unusual accomplishment made possible by the thoroughgoing foundation established by the extension workers. Originating as a war emergency measure, the latter service has been so outstandingly successful in aiding growers to eliminate losses from disease and insect pests that it has been continued and extended to include fourteen counties, and is largely supported by local funds. Being somewhat of a departure from the usual type of extension work, the spray service has been watched closely by workers in other States and in the Federal Department of Agriculture. The plan, with modifications, is now being undertaken in other States.

(2) The organization of the subject matter of plant pathology as represented in the courses dealing with fundamentals. The State College of Agriculture is perhaps the outstanding institution in this country for the teaching of plant pathology and mycology. Its teaching outlines or texts are used in many other institutions. Foremost rank has been attained by the recognition given good teaching and the appointment of men of high qualifications as teachers.

(3) The development of graduate training in plant pathology. The following figures will give some idea of the amount of graduate instruction in the department:

Total number of graduate students up to July 1, 1927:.....	291
Majors:	
Registered for the doctorate.....	118
Registered for the master's degree.....	24
	<hr/>
	142
Minors:	
Registered for the doctorate.....	75
Registered for the master's degree.....	44
	<hr/>
	119
Total number who have received degree up to July 1, 1927.....	94
Graduate students enrolled in 1926-27.....	56
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Of students who received their doctorates in this department, 31 are now holding teaching or research positions in this or other institutions.

(4) The introduction and development of the industrial-fellowship idea in plant pathology.

The introduction and development of the temporary-field-laboratory method in plant pathology. This plan of conducting experiments gives opportunity to study diseases under field conditions, and has been also to give valuable training to graduate students.

The development of lime-sulfur as a substitute for bordeaux in orchard spraying. Experimental and demonstrational work in New York established the relative merits of these two fungicides, and led to almost universal substitution of lime-sulfur for bordeaux mixture in orchard. The new material has played an important rôle in the production of high-grade fruit in this State.

The introduction and development of dusting as a substitute for spraying in the control of diseases, especially of orchard crops. Modern fruit production must meet the demand for high-quality fruit, which is fruit free from diseases and insect injuries. With the concentration of fruit production in large acreages, a rapid method of covering the trees with an effective fungicide was sought. This led to the development of dusting, which has now partly replaced spraying. As new material and machinery are developed, it is expected that dusting as a method will be extended.

The development of the control of potato diseases through potato selection and the use of certified seed; also tuber indexing as a method of improvement. Because of the place held by New York in the production of potatoes, both seed and table stock, it was logical that considerable attention should have been given to diseases of this crop. The contributions of this department have been of great use, and some of the methods now in general practice throughout the country were developed by the research workers here.

The development of the standard laboratory method of testing the relative efficiencies of fungicides. Methods now in general practice were developed by the research workers here, who are continuing to add to the knowledge of this subject. This continues to be one of the major problems and is of first importance in aiding the growers to select from the great numbers of fungicides now being offered for sale those which are most effective and economical to use.

Limitations imposed by inadequate support. While this department holds the foremost position among institutions in this country teaching plant pathology and mycology, it has been so handicapped by the lack of suitable buildings and other facilities that it has been unable for more than a decade to offer instruction to all of the undergraduates seeking training in plant pathology. This is a serious situation, since all students interested in plant pathology should understand the principles of disease control. The limits of facilities were reached years ago, and the teachers have been working under the handicap of attempting to maintain superior teaching under conditions inadequate from practically every point of view.

As pointed out in the annual reports for the past several years, the limits of the facilities in the field of graduate work have been reached, and there are indications that the department will be called upon to provide for a constantly growing number of applicants. The prospective increase is due to the larger demand in institutions, organizations of growers, commercial concerns, and experiment stations, for highly trained

technologists in plant pathology. It is difficult to see just how the increase is to be met, since there is no easy way of refusing to accept highly qualified students desiring to pursue postgraduate work. This year it was necessary to crowd six additional desks into the advanced laboratory which was already overcrowded, and to assign more than one student to each desk, which is an inefficient and very undesirable arrangement. The necessary lowering of the quality of teaching under existing conditions is a justification for limiting the number of graduate students, and it is evident that such a course will be necessary. There are strong indications that the time is not far distant when the larger growers, communities, and agricultural organizations will employ their own plant pathologists, and the College must be in a position to train men for these posts.

In connection with the teaching and research, the department is further in need of increased funds for equipment and supplies. Certain expensive pieces of apparatus are needed, whereas the department has barely sufficient funds for the purchase of routine laboratory equipment. Reference is made to such apparatus as a series of chambers for soil-temperature control, and a similar series for air and humidity control, both to be housed in and used in connection with the greenhouses. A relatively large number of microscopes are needed to replace those at present in use.

There has long been need for facilities to do chemical work, and the lack of the necessary equipment, together with the lack of room in which to house such equipment, is one of the ways in which the present inadequate housing is seriously curtailing the normal development of the department. Modern plant pathology concerns itself with physiological and chemical aspects of the subject, rather than with purely mycological aspects. With no facilities for chemical work, the department is unable to undertake numerous investigations which the staff is qualified to handle and which would materially advance the knowledge of the nature and control of important diseases. While the College has been waiting from year to year for the new building in order that room and facilities might be obtained for such work, it has been failing to keep pace with the development of the science. The investigators are laboring under a handicap which no amount of enthusiasm or resourcefulness will overcome, and the students are trained less thoroughly than modern requirements demand.

Increased greenhouse space and a suitable area for experimental plantings, together with funds to enable the department to conduct field experiments at Ithaca, would add greatly to the research. The department has never had support for this kind of work, and the situation would have been almost hopeless but for the special temporary fellowships granted by growers' organizations and private companies. The value of conducting experiments in orchards and fields about the State, in cooperation with growers, is not underestimated, but certain experiments can best be conducted near the laboratories and under conditions not available in commercial plantings.

Certain increases in the staff for teaching, extension, and research, together with promotions in salary and title, are necessary if the department is to retain the services of qualified workers. The direction of the work of the special field assistants, an important phase of the extension work, should be in the hands of a full-time worker of the grade of assistant.

professor. A worker well trained in chemistry, a cereal pathologist to cooperate with investigators in plant breeding, a mycologist to strengthen work in the physiology of the fungi, and a curator of the herbarium, needed additions. The appointment of nontechnical assistants, and also for the employment of a good gardener, are urged as means of materially increasing the productiveness of the present staff at a relatively small investment.

The work of the College in plant-disease control can be materially enlarged before the point is reached where the expediency of further expansion may be justly challenged or the question of maintaining proper balance raised. Many plant-disease problems commonly encountered are entirely new or are so little understood that no satisfactory information regarding them can be given to growers or taught to students. A restudy of many of the old problems, in the light of advances on related problems and in other fields, is needed. It would seem to be sound policy on the part of the State to provide expansion in those directions where returns from investment are obviously certain and economically large; this is the situation that exists in plant pathology.

Pomology

The development of the department. Although some instruction in horticulture, including pomology, was doubtless given in the general agricultural courses of the University from its very beginning, the first horticultural report, made by Professor W. R. Lazenby for the year 1879-80, refers only to experiments with vegetables. In 1884 Professor G. C. Caldwell, Agricultural Chemist, conducted the first official experiment at Cornell University on any fruit plant. He applied various forms and amounts of potassium to some grapevines with the hope of increasing the sugar content of the fruit.

Systematic growth in pomology, as well as in other phases of horticulture, began in 1888, when Dr. L. H. Bailey was appointed horticulturist. The variation of plants under culture was the general theme of investigations which he planned to follow. A collection of many varieties of wild and cultivated fruit species was soon established, which served as an important source of material for systematic study until the plantings were destroyed some fifteen years later.

Bailey's first publication at Cornell, *Windbreaks in Relation to Fruit Raising*, appeared in 1889. In the spring of 1889 experiments on fertilizers for pear, apricot, and plum trees, with especial reference to the value of the commercial fertilizers, were laid out. The failure of the fruit crop in New York in 1890, after a good bloom in the spring of that year, called forth a bulletin which directed attention to the need for study in fruit raising and for the development of practical control measures of fruit insects and diseases. In 1890 the first tests at Cornell on the spraying of plants were made by Bailey, and in 1891 a bulletin (no. 35) on *Fungicides and Insecticides* was issued by C. G. Lodeman, the newly appointed assistant in horticulture. From 1891 until his death in 1896, Lodeman, working in horticulture with Bailey, directed most of his attention to the development of practical methods for the control of insects and diseases of fruits.

From 1890 to 1896, Bailey published about forty bulletins on horticultural subjects, mostly in the field of pomology. These early papers dealt with the varieties and culture of the common fruit plants and with insect and disease troubles. They were exceedingly important in pointing out some of the problems of the fruit growers as well as in enlisting the interest and support of the work of the agricultural experiment station.

In 1895, Director I. P. Roberts conducted a careful study of the chemical requirements of apple trees, based on the amounts of nitrogen, potassium, and phosphorus actually found in the tree. This work had a marked influence on the fertilizer work with fruit plants. One of the pioneer papers on the subject of pollination in orchards was published in 1896 by S. W. Fletcher, assistant in horticulture.

In 1901 Professor John Craig was added to the college faculty in extension teaching. He published a bulletin (no. 198) on *Orchard Cover Crops* in 1902, in which he called attention to this important phase of orchard soil management. On the retirement of Director I. P. Roberts in 1903, L. H. Bailey was made director of the station and John Craig was placed in charge of horticulture at that time. Bulletins on the pink rot of apples, sprays, nut culture, and the forcing of strawberries, are among the physiological publications by Craig from 1903 to 1907. In 1905 the first series of orchard surveys of the western New York fruit counties was published by G. F. Warren, who held a fellowship in agriculture. These publications have served a useful purpose in teaching and extension work and have shown that those growers who followed practices recommended by the experiment station were the most successful. In 1908 the work in pomology was essentially in charge of C. S. Wilson, but remained in the Department of Horticulture until 1913. In 1909 the teaching of horticulture was organized into several divisions: graduate, in charge of Craig; pomology, in charge of Wilson; and olericulture and floriculture, in charge of L. B. Judson.

Soon after the establishment of the New York State College of Agriculture in 1904, and especially upon the completion of the buildings in 1906, there was a large increase of students in the courses in pomology which involved heavy teaching schedules. The investigational work in pomology during this period was still concerned largely with the practical control of orchard pests. An important development during the period from 1910 to 1912 was the establishment of an extensive orchard on Denison Road. This orchard is now a valuable part of the equipment for both teaching and investigational work.

In 1913, following the death of Professor Craig in the fall of 1912, the old Department of Horticulture was resolved into the present three divisions: Pomology, Floriculture, and Vegetable Gardening. In the new Department of Pomology an intensive research program was soon under way, including studies on winter injury, pruning and growth studies of young fruit trees, comparative studies of fertilizer requirements of brambles and other fruits, factors influencing the set of fruit, and many other physiological problems. In outlining this new program of investigation, an attempt was made informally to coordinate the studies with those at the New York Experiment Station at Geneva and to avoid duplication of the work at Geneva, as, for example, the important studies of

development of varieties and stocks. It was also taken for granted that development of the spraying practices had proceeded to such an extent that further advances along that line would require the technical research of trained workers in pathology and entomology, and this work was left to these specialized departments.

The importance of fundamental studies. In the teaching and investigational work of the department, emphasis is placed upon the fundamental study of the fruit plants and their products, the object being to develop a scientific basis for interpreting the responses to various cultural practices to differences in soil, climatic, and other factors. The fact that each member in the department has opportunity to devote a period of each year to uninterrupted research undoubtedly helps to provide an impetus to the instructional work and aids in maintaining it at a university level. The student is taught to evaluate the evidence and to develop a scientific habit of mind rather than to rely solely upon authority.

The end sought in the extension service in pomology is a stabilized fruit industry based on increased efficiency and economy in production, marketing, and utilization of the product. The extension work, too, is based on experimental work at Geneva and Ithaca, and aims to acquaint the grower with the most reliable facts that bear on his problems.

Relations with other departments. While the Department of Pomology deals with the problems of fruit culture and utilization, it is recognized that persons engaged in the fruit industry are continually encountering problems the solution of which requires a wider range of knowledge than is covered in the teaching and investigation in this unit. Pomology involves a knowledge of botany, chemistry, plant breeding, and the soil sciences. The student whose chief interest lies in the field of pomology is therefore required to choose work in the departments dealing with these allied fields. The Departments of Plant Pathology, Entomology, and Mechanical Engineering offer courses which every student in fruit growing is expected to take, since the control of insects and diseases by means of spraying or dusting is one of the essentials for successful fruit growing. For many of the economic phases of the fruit industry, the student goes to the Department of Agricultural Economics. Furthermore, since in New York orcharding is often combined with other farm enterprises, students majoring in pomology generally elect courses in practically all other applied departments of the College.

In the investigational work, the members of the department have the opportunity for frequent consultation with those who are doing related work in other departments, and there exists a healthy spirit of cooperation which enables the work on problems that touch several fields to be done to the best advantage and with little duplication.

Contributions to education. The contribution of the department to the progress of agricultural education is indicated by the fact that in practically every State in which pomology is of appreciable importance the horticultural staff has one or more members who have received their undergraduate or graduate work in pomology at this institution. Among them are the heads of twenty-four horticultural departments in as many States. In addition there are teachers in pomology in England, China, Japan, South Africa, Bulgaria, Central America, and the Philippines who have done their graduate work at this institution.

In all of its research and teaching, the department has emphasized a more thorough understanding of the fundamental nature of the plant and its reaction to its environment. The scientific point of view in solving the problems of the fruit industry has had a very marked influence on the progress of pomological research throughout the country.

Some fields of endeavor for students trained in pomology. In its instruction the department endeavors to help prepare students to meet the problems encountered in the practical production and handling of fruit. Instruction is planned also to be of benefit to those who expect to enter businesses concerned with the fruit industries of the State, such as the operation of central packing houses, cold storage, refrigeration, and fruit-product industries and fruit-distributing agencies. The technical instruction offered by the department is needed by those who are planning to enter such forms of public service as county-agent work, agricultural-high-school work, state and federal fruit inspection, or other Civil Service positions in horticulture.

In its graduate instruction the department helps to train professional workers whose interests lie in the field of pomology in this and other countries. The professional workers engage primarily in college teaching and experimental work with fruit.

Future development needs. Experience indicates that real progress in the field of pomology must be based on a very broad and thorough knowledge of all phases of the life history and the reactions of the fruit plant and its product under the various conditions which obtain. Specific problems of culture, and questions regarding the modification of practices which will arise from time to time, can be answered rationally only if one possesses such fundamental knowledge. Workers are still groping in the dark with many unknown or little understood factors which may assume considerable importance as the industry faces new conditions. For example, we cannot always foretell with certainty the adaptability of a given piece of soil for such long-time crops as fruit, nor do we have dependable means of regulating or modifying the production. We need to learn far more about the physiology of fruiting to the end that we may avoid the very small crops which frequently alternate with years of over-production. If the large investments in orchard properties are to be safeguarded, and if the fruit industry is to remain an important source of wealth to the State in competition with other States and with other products, the grower will have to learn how to produce more economically and probably at a smaller margin of profit. This calls for a finer adjustment in practices and for more reliable knowledge.

At the first opportunity a well-trained biochemist should be added to the staff to help in the research dealing with the nutrition of fruit plants. The lack of systematic instruction in biochemistry and microchemistry with special reference to plants constitutes a serious gap in the technical training of students, especially in graduate work. Provision should be made for such work as soon as possible. There is also urgent need for several technical assistants in this department.

The completion and equipment of the Plant Industry Building, and the provision of greenhouse space for pomology, will make available good indoor laboratory facilities for the department. The present experimental

orchard consists mainly of young trees and serves admirably for the work under way. There is need, however, for a mature orchard in a good fruit section under absolute control of the College. While the College now has experimental plots on several privately owned orchards, it naturally hesitates to use such trees for investigations that may involve the future behavior of the orchard. Experience has shown the desirability of applying under actual field conditions the scientific principles that result from laboratory studies before definite practical recommendations are formulated.

While the modern cold storage and packing house are sufficient for the present, the department will soon require additional space for handling the fruit. There is now no adequate storage space for the spraying outfits and other orchard implements.

Poultry Husbandry

Some of the important contributions of the Department of Poultry Husbandry are as follows:

(1) The boys' and girls' club work in New York State was started in Elmira by Rufus Stanley in cooperation with this department.

(2) Systematic poultry-culling demonstrations and field work were inaugurated by the department, and now more than 250,000 birds are individually handled every year by members of its staff.

(3) The first systematic attempt to teach the judging of poultry for production was made at this institution and it resulted in the organization nine years ago and the continuation to the present time of the Cornell poultry-judging school.

(4) The development of production judging at poultry shows, the reorganization of premium lists to include production classes to meet the needs at county fairs and at the State Fair, and the holding of the New York State production poultry show, were developed by the department.

(5) The Cornell breed-testing station, providing for advanced registry and official pedigree hatching of poultry, was inaugurated by the department and was the first attempt to accomplish this purpose. There were 150 birds entered and these produced about 13,000 pedigree chicks this year for the owners.

(6) The department was the first institution to take up seriously the scientific investigation of methods of illumination as influencing egg production. This has included artificial light as affecting the length of day and the method of feeding, the use of ultra-violet rays as influencing the metabolism of feed and the growth of poultry, and high-frequency electrification as affecting the development of chicks. Investigations of these projects have covered many years and the utilization of many hundreds of birds.

Rural Engineering

The development of the field. Rural engineering is the application of engineering and architecture to farming and farm living. Many phases of mechanical, electrical, civil, and sanitary engineering are included. The development of this field is relatively recent. Its background is reflected in the following important steps in the progress of machine invention: the cast-iron plow was invented in 1797; the mowing machine in 1831; the

grain harvester in 1833; underdrainage was first introduced into the United States in 1835; the steel plow was invented in 1837. The extensive use of modern farm machinery began about 1857.

Today, engineering items of prominent interest in New York farming include: (1) power farming—tractors, trucks, automobiles, and combined harvester-threshers; (2) better homes—bathrooms, domestic equipment, electric lights, and radio; (3) land drainage; (4) better dairy barns, and barn sanitation and ventilation.

Instruction in rural engineering was formally organized at the New York State College of Agriculture in 1907, but some work had been offered as a part of general agricultural instruction prior thereto. The American Society of Agricultural Engineers was organized at Madison, Wisconsin, in 1907, and the first paper was presented by a representative from the New York State College of Agriculture.

The first staff member chosen was a mechanical engineer with strong agricultural interests. The second was a mature, farm-reared, professional civil engineer, well versed in farm drainage. It has been under his direction that the successful extension work of the department has been promoted. From this beginning the department has gradually developed to its present dimensions and serviceability.

Rural engineering as a distinct body of knowledge has, in the first instance, grown out of the activities of the men who built the machines, laid the drains, and built the homesteads for modern agriculture. Early manufacturers tended to a policy of individualism and differentiation which found expression in machine parts that differed from all others, and such few engineering data as were consciously recorded were jealously guarded from inquisitive rivals. It is only in comparatively recent years that any exchange of technical facts in agricultural engineering has developed.

Since the subject itself was new and its technology was unorganized, it was but natural that the early teaching in the colleges should have been much along the lines of conventional engineering instruction, without adequate agricultural application. With an ever-increasing contact with the actual farming needs of the State in engineering matters, however, all branches of the departmental activity have now become vitally agricultural in their nature. It is increasingly evident that rural engineering is a branch of engineering quite distinct from the conventional branches because of the many specialized requirements of agriculture.

Contributions. Perhaps the most significant contribution to the farming of the State has been in land drainage. An average year's work includes the holding of from 200 to 250 demonstration meetings; the actual work done by farmers as a result of the meetings amounts to the laying of from 10,000 to 20,000 rods of tile drain, affecting from 400 to 800 acres of land, and the digging of from 6000 to 15,000 rods of open ditch, affecting from 1500 to 3000 acres of nearly unproductive land. In addition to these direct results on the fields where the demonstrations are held, many other farmers are stimulated by them to install drains to an extent of which there is no record.

The most recently completed investigation has been the authoritative determination of exactly what happens in dairy stables with different systems of ventilation, and the promulgation of specific rules and formulae to insure success in ventilation. This work is of especial significance at this

time in connection with the efforts to eliminate tuberculosis from the dairy herds of the State and to insure the production of market milk of the highest quality. Its importance has been quickly sensed by farmers.

Power farming is being intensively studied at present. Extensive records of actual achievements and costs under rather difficult conditions are being carefully kept. Tractors, dynamometers, and lubricant-testing equipment have been acquired for these studies, and power cultivators, tractors, and combined harvester-threshers to a value of about \$6000 have been lent by manufacturers. The applications of electricity to agriculture are being studied in cooperation with the power companies of the State and other departments of the College, both on the college farms and on private farms elsewhere in the State.

As contributions toward the betterment of country living, this department early undertook to assist in the introduction of bathrooms, sinks, and sewage disposal for farm homes. The problem of sewage disposal was first attacked by carefully adapting known scientific and engineering facts to a design of septic tank which would be simple and easy to build. This design has since been largely adopted in this and other States. Household and barn water systems were fostered by means of specially equipped trucks which traveled throughout the State giving demonstrations of how to install water systems. A motion-picture film showing a practicable way to develop a complete home water system from inexpensive beginnings was prepared in cooperation with the State Red Cross and the State Department of Health, and this has been much used in extension work. These various efforts have yielded considerable progress.

The sewing machine, which is found in nearly every farm home, is often ill-cared-for and it is mechanically complex. Extension workers in sewing reported the need for sewing-machine schools. Such schools were accordingly developed by the extension staff and they have become unexpectedly popular. Of 230 extension schools of various kinds conducted by this department during the past year, 106 were one-day sewing-machine schools. A total of about 5000 machines have been renovated by the women themselves at these schools since the work began. This means a net value to these women of from \$15,000 to \$25,000 in repairs, at current rates for overhauling. In addition, the experience at the schools serves to create in the women interest and confidence in the lubrication, adjustment, and care, not only of sewing machines, but also of the ever-increasing array of other machines to be found in American farm homes.

The first bulletin published by the department was on knots, hitches, and splices. It proved of real value to farmers in explaining the bowline knot and the long splice for use on hay ropes. It led the way to the junior-project work of this department, in which boys are taught such skills as knot tying, splicing, and making rope halters; stitching, oiling, and repairing harness; soldering; filing saws; elementary woodworking exercises; and simple gas-engine work. Last year 426 boys completed assigned work and earned certificates in the junior-project activities of this department.

Needs. The department needs more ample quarters, as machines are bulky and both teaching and investigations require much space. It needs also more technical equipment, for it has been much handicapped by inadequate support. Further, there is need for increased personnel for the problems of farm-building design and construction.

Rural Social Organization

The viewpoint underlying the work of the Department of Rural Social Organization is set forth in the following paragraphs:

There seems no reason to doubt that the discovery of scientific truth and its application through education may eliminate much of the social loss which now occurs in the process of learning through mere experience, or trial and error. First there must be research to establish a body of knowledge; then this must be made a part of the mental content of mankind, and it must become established in the mental habits before it can be effectively utilized in everyday life. This is the task of education.

As has been pointed out by many leading minds, the greatest difficulty which faces modern civilization is that with the rapid advance of discoveries and inventions human life is being increasingly controlled by material culture. Society is thus far unable to maintain a satisfactory social control by readjusting the non-material culture fast enough to meet the rapidly changing social situations created by the new physical environment. Instead of man's utilizing his material creations for his own purposes, his purposes are increasingly determined by the things of his creation. As one writer has put it, "Things are in saddle."

Only through an education which will give as adequate knowledge of the structure and processes of society as the results of research may make possible, can we hope to acquire a better ability to control environment and not be controlled by it — which is the measure of human progress. We have learned how to think in terms of horse power and kilowatts, of bonds and stocks, of electrons and vitamins, and we are able to recreate our material environment with kaleidoscopic rapidity; but concerning human life as associated in society we have little precise knowledge, we still think in terms of our own experience, and we have not been able to acquire a scientific method of thought. Is it not, therefore, one of the immediate responsibilities of our educational institutions, not only to foster social research, but also to give such instruction in social science to their resident students and through their extension service to farm people as will enable those persons to come to a better understanding of their social environment and how they may be able to readjust it so as to realize those values in life which will insure a progressive human welfare? Obviously the creation of a scientific attitude and method of thought with regard to social phenomena is a task which will require many years of effort and will bear fruit only with on-coming generations; but as scientific research and its application through education have revolutionized the technic of agricultural production and are now changing agricultural economics, so the same sort of scientific method may gradually enable us to secure increasing control of the more complex social problems of agricultural life.

The development of the department. This College was one of two agricultural colleges which commenced giving instruction in rural sociology in 1904-05. It was offered in connection with the work in rural economy. With the growing interest in both of these fields which became evident in the decade following, it seemed desirable to create a separate department for the study of the social aspects of country life. A professorship of rural social organization was therefore established in 1915, but actual

work was not commenced until the appointment of the present head of the department in 1918. Research work was commenced in 1919, with the appointment of an assistant professor. Extension work was begun in 1921. The history of the department is coincident with the post-war depression in agriculture, during which time the attention of farmers has been chiefly centered on their economic problems. Out of this study of their economic problems has come an increasing interest in securing a higher standard of living for farm people, and an increasing conviction that a progressive cultural civilization will depend not only upon a better economic income, but also upon a desire for and an insistence on those social institutions and that standard of culture which will make rural life equally attractive to the life of the town or the city. The fundamental satisfactions of farm life are being evaluated more profoundly than ever before, and the scientific study of the social aspects of rural life becomes increasingly important as a means of building a virile rural society.

Contributions through teaching. Inasmuch as there are few positions available for those who specialize in this field except in teaching and research at universities and colleges, professional education in this department is practically confined to graduate students. Its undergraduate courses, however, give a general knowledge of the social organization and psycho-social phenomena of rural society which is essential for all those who expect to deal with the human problems of country life, whether farmers, teachers, extension workers, or employees of farmers' organizations. Like history, psychology, and economics, rural social organization gives the student a body of knowledge and a method of thought essential for the intelligent understanding of rural life. Thus the work of this department relates itself more specifically to those departments of the College and of the State College of Home Economics which deal with the human side of agriculture. It furnishes a fundamental approach to the economics through its consideration of the family as a human institution and the relation of the family to community and other social organizations. It relates itself to agricultural economics in its study of the principles of group organization, especially as related to cooperative agencies and the geographical units of social and economic organization of rural society, and in its analysis of rural leadership and all the social psychology of rural life. It furnishes a basis for the philosophy and administration of rural education through its consideration of the relation of the school to the community and to the family, and by furnishing a knowledge of the social institutions, the forms of association, and the social psychology of rural life, which is essential both for the training of the teacher and for furnishing subject matter for courses of instruction in secondary schools, particularly in those schools which are training rural teachers. Lastly, the subjects mentioned above are essential for all who are training for extension work in agriculture or home economics.

The total number of students taking work in the department during the academic year averaged 77 for the four years 1922-23 to 1925-26, but during the past year it increased to 112. This increase in enrollment in undergraduates, as the number of graduate students has remained an average of 34 for the past four years.

Instruction in the summer school is equally important and has an increasing constituency. In the summer of 1924 the work was taken by 175 students, in 1925 by 130, and in 1926 by 219.

Needs. Some consideration is being given to the possibility of offering an introductory course which should deal with the origin of man, the rise of agriculture, the place of agrarian problems in the history of civilization, a résumé of the evolution of human nature, and the relation between rural and urban society, and which should give an introduction to the social, economic, and political problems of modern rural life. The inauguration of such a course, however, must be delayed until the staff can be strengthened by the addition of a teacher of the rank of assistant professor who could at the same time develop other fields which are needed.

This institution is one of three or four in the United States to which advanced students are looking for graduate instruction in rural sociology, and is the only one in the East. Two factors are now deterring numbers of graduate students from coming here. One is the inadequacy of work in general sociology, and the other is the lack of fellowships. With the agricultural experiment stations inaugurating investigations in rural sociology under the Purnell Act, there is an increasing demand for graduate training; but most of the men desiring advanced training have been out of college for some years and many have families, and they find it difficult to finance graduate work without some assistance. From the nature of the subject it is desirable that only rather mature students should undertake graduate work in this field, so that there is a very real need for a few fellowships for such students. Despite these handicaps, a survey of the situation still reveals that no other institution has had as great a number of students working for the doctorate in rural sociology; but the number might easily be trebled if the university offered adequate work in general sociology, and if fellowships to aid deserving students were available.

The College needs also to consider the possibility of offering a curriculum for the training of rural social workers. The College has assurance from leaders in this field of work that from ten to fifteen graduates of such a course would readily find positions in New York State alone each year. With the growth of social work in rural counties, it is apparent that rural social workers should be trained where they can receive instruction in agricultural economics, home economics, and rural social organization, and should have their field work under rural conditions. The development of such a curriculum would require an additional assistant professor and an instructor in charge of field practice.

This department is also one of those most handicapped by lack of adequate space for its work. The very crowded conditions under which it is compelled to exist operate greatly to reduce its efficiency and impose very severe handicaps on the staff. No relief can be afforded until the State provides additional housing for the College.

Vegetable Gardening

The development of the department. The Department of Vegetable Gardening was established as a separate department in 1913, and was the first independent department in this field at any institution in the United States.

es. Prior to 1913, courses in vegetable gardening had been given and considerable experimental work had been done, as is outlined in the report of the Department of Pomology. Dr. L. H. Bailey was one of the pioneers in vegetable-gardening teaching and research, and the department benefited from the impetus which he gave to this field. The organization of the teaching, research, and extension developed rapidly after 1913, and much valuable work was under way when it was interrupted by the war.

Following the enlistment in the military forces of the head of the department in 1917, the work in vegetable gardening was temporarily merged with that of farm crops, and it was not until 1921 that the re-establishment of the independent department became possible. The work is now again well organized and a well-balanced program is being carried forward.

In 1922 the Legislature, by special act, made special provision for vegetable-research work on Long Island, and enabled the establishment of the Long Island vegetable research farm at Riverhead as a valuable laboratory for the department. The farm consists of about 28 acres of land well suited to experimental work, and many of the necessary buildings and equipment for a good program of research.

Relations with other departments. The Department of Vegetable Gardening is an industry department, and the industry which it represents has very intricate and serious problems that require the services of men trained in several fields of science. Many other departments of the college contribute, either directly or indirectly, to the solution of these problems. Part of the work of this department is to interpret and to apply the results obtained by workers in the foundation and the agricultural sciences to the solution of practical problems in the growing and handling of vegetables.

Contributions through teaching. Perhaps the most important contribution of the department to the vegetable industry has been the training of students who have specialized in vegetable gardening. During the past few years this department has had more specializing students than has any other similar department or division at other colleges of agriculture. About half of these specializing students have gone into farming, mainly vegetable growing, where they have achieved success. Approximately half of the remainder are engaged in public work as teachers, investigators, extension workers in vegetable gardening, while most of the others are engaged in businesses closely related to the vegetable industry.

No small part of the teaching contributes to the training of the non-specializing students, who go into farming or into other lines of work with an interest in vegetable growing and an appreciation of the place which it occupies in the general scheme of agriculture. In undergraduate teaching the department endeavors to help prepare students (1) for general farming in which vegetable gardening is a minor part, or for other employment, as county agents or teachers of agriculture in high schools, in which some knowledge of vegetable growing is desirable; and (2) for specialized vegetable growing or other work in which a knowledge of vegetables is of major importance. The graduate teaching aims primarily to prepare students for teaching and research in vegetable gardening. During the past year 10 students have pursued graduate work in the depart-

ment, 6 of whom were specialists in vegetable gardening at other institutions before enrolling here.

Registration in vegetable-gardening courses has always been lower than the importance of the vegetable industry would seem to justify, and it is believed that this is due to the fact that a considerable number of students think of vegetable gardening as a very minor part of agriculture. In fact many think of it only in connection with home gardening on the farm which is carried on largely by women and children. Commercial vegetable growing, as now conducted, is a relatively young field and until recently has not been promoted as have other special agricultural enterprises. With the growing interests of consumers and of nutritionists in the use of vegetables, and the large increase in production, it may be expected that the number of students will increase in future.

Contributions to the solution of problems in vegetable growing and handling are contributions to the progress of agricultural science. The vegetables grown in New York represent approximately one-fourth of the total value of all crops in the State. In addition to the direct contributions to vegetable production, the principles and methods worked out in connection with studies of nutrition, cultivation, transplanting, and reproduction are applicable to other agricultural plants, and have advanced the knowledge of the physiology of growth and reproduction.

Needs. The most essential needs of the department are (1) better accommodations for students, especially better and more adequate laboratory facilities and equipment, (2) more land for experimental work at Ithaca, (3) larger appropriations for maintenance, and (4) an increase in staff to enable the department to take up new lines of work. There is an urgent need for work on vegetable handling to parallel the economic studies which are being made in vegetable marketing. Careful studies should be made of the cultural practices affecting the market quality of the important vegetables, and of the effect of methods of harvesting, grading, packing, loading, storing, and transporting on the quality of the product when it reaches the consumer. Before such studies can be undertaken in a serious way, there must be additions to the staff, since the important problems already under investigation require the time of the present members of the staff. It is necessary to continue and to extend the present work on the problems of production. The department needs the service of a plant chemist for the chemical studies in connection with plant nutrition and for other problems now under investigation.

RESEARCH ACTIVITIES OF THE STATE COLLEGE OF AGRICULTURE AND OF THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

By special request of the Dean, the report of research activities is this year devoted chiefly to a more or less general but necessarily brief review of the contributions that have been made to agricultural science and practice through the research work of the several departments of the College in recent years. This is followed by a specific review of the contributions of knowledge in these fields during the past year in the form of abstracts of articles which have been published during the year by members of the staffs of the several departments. These reviews are based upon state-

its that have been sent to the Dean by the heads of the several departments and have been brought together into this one report from the office of the Director of Experiment Stations. A similar report of the progress of the New York State Agricultural Experiment Station at Geneva has been prepared and published separately as the Forty-sixth Annual Report of that Station.

The following is a very brief review of some of the more outstanding recent contributions to the knowledge of agricultural science, farm practice, and rural life, which have resulted from the research work of several departments of the College.

Agricultural Economics and Farm Management

In many fields of research the scientific method is to set up a series of tests that differ in one particular only, so that a measurement of the importance of some one factor may be made. Usually this method is not applicable to economics or in business research. In these fields, it is necessary to take the data concerning existing conditions and apply statistical methods and analysis to determine the effect of each factor. Since such methods were developed later than the experimental method, research in economics has not progressed so far as has research in the physical sciences.

As indicating the character of the research work of the Department of Agricultural Economics and Farm Management, two important contributions in the application of statistical methods to scientific research may be mentioned. In the study of farm management, the analysis of the results of operation of large numbers of individual farms has contributed information of great value. The same method is now being applied in marketing studies. The major aim in all such work is not merely to find the principles involved, but to aid in the general application of these principles so that greater efficiency may result.

Until recently, the principle that supply and demand govern prices was about all that was known concerning the relationships of these three variables. This department and students trained in it have contributed a very large amount of work in the exact measurement of the relationships of supply, demand, and prices. It is now possible to state mathematically what effect a given change in supply of many commodities will have on retail prices, on wholesale prices, and on farm prices. For a limited number of commodities, it is possible to state what effect a given change in retail price and in farm price will have on future supply, and on what date the influence on the future supply may be expected. It is possible also, for some commodities, to state what effect a given price change will have on consumption. These studies are being extended to other commodities. The importance of such definite knowledge is so evident as not to require discussion. The following single illustration will suffice.

In the spring of 1927 it became evident that there would be a shortage of milk on the New York market in the fall of 1927 unless some measures were taken to provide for an increased supply. From the knowledge of breeding obtained by the Department of Animal Husbandry, it was possible to state how much increase in supply of milk could be obtained from this territory and how soon the practices would have to be changed in order to

obtain it. From the work of this department it was possible to justify the increased production, and from further work in this department it was possible to state what change in consumption would occur if an increase of one cent per quart were made in the retail price of milk. By thus coordinating the work of the various departments, the procedure of public officials and of farmers' cooperative associations was given a definitely scientific basis instead of being left to partisan controversy.

Because of the early establishment of research work in this department and because of its large amount, many graduate students have come here to study in these fields. In the year ending June 30, 1927, 54 graduate students were taking their major work and 50 were taking minors in the department. These students came from 29 States and 11 foreign countries.

Agronomy

The most significant contributions by members of the Department of Agronomy to the progress of agricultural science may be classified under three headings: (1) transformations of nitrogenous compounds in soil, (2) lysimeter studies on income and outgo of plant nutrients from soil, and (3) methods of experimentation with particular reference to devices for reducing the experimental error in field experiments.

In the course of the investigations in the first of these subjects, it has been demonstrated beyond question that the growing plant causes a disappearance of nitrates from soil in some way other than by absorption by the roots of the plant. The hypothesis has been advanced, and much evidence furnished in support of it, that this is accomplished by liberation from plant roots of carbonaceous matter which furnishes energy for soil organisms, and that these consume nitrate nitrogen, converting it into other forms. The living plant is thus a conserver of nitrogen because it helps to convert a soluble form of nitrogen into an insoluble form and thereby prevents its loss in drainage water. On the other hand, it represents the formation of nitrates and thus inhibits its own growth. In the course of the investigation the fact was established that the living plant liberates organic matter from its roots and that part of this is nitrogenous. In other words, there is a return of nitrogen to the soil as well as absorption from the soil.

In connection with these investigations it has been noted that different field crops exert characteristic effects on the accumulation of nitrates in the soil on which they are growing, and that this is reflected in the quantity of nitrogen which appears in the drainage water. This is apparently dependent on the nitrogen-carbon ratio of the organic matter liberated from the plant roots.

It has been demonstrated that the injurious effect of sod on the growth of young fruit trees is due to this interference with the accumulation of nitrate nitrogen. In other words, the trees cannot compete successfully with the nitrate-consuming organisms when they are supplied with energizing material by the grass roots.

The decomposition of plant tissues in soil have also been dealt with, and it has been shown that here also the nitrogen-carbon ratio is the potent factor in determining the rate at which nitrates accumulate during the

process of decay. A large proportion of carbon favors the development of nitrate-consuming organisms and thus curtails the accumulation of nitrate nitrogen. The relation of these phenomena to crop rotations is now being investigated.

The removal of plant nutrients and other constituents of soil by means of drainage water is the second field of investigation to which attention has been given. Lysimeters, built in 1908, have furnished excellent facilities for this work. For nearly twenty years the drainage water from soils under the controlled conditions made possible by the lysimeters has been collected, measured, and analyzed. The investigation looks toward increasing our knowledge of soil deterioration and conservation. It has been possible for the first time to make a clear-cut distinction between the loss of nitrogen from soil in drainage water and the loss due to some cause not yet discovered. It has been shown that plant growth decreases the soil losses of calcium in large quantities and of some other bases in smaller quantities. In periods when the soil is bare the losses are very large. The relations of a number of crop plants to losses of nutrients in drainage water have been worked out. As to the adequacy for continued crop growth of the supply of sulfur in the soil, the experiments gave a definite figure on the removal in crops and drainage water and the accretions through rainfall and farm manure.

In the way of practical information, the lysimeter experiments have shown the extent to which the unavoidable losses of fertilizer constituents and agricultural lime are to be expected and replacement made; how this is affected by treatments of the soil in various ways; how economies in liming and fertilizing may be effected; to what extent the rainfall takes the place of fertilizer; and what may be expected of leguminous crops as a substitute for commercial nitrogen.

The third research effort, in which more than ordinary progress appears to have been made, is in devising apparatus for conducting experiments in plant production under controlled conditions. The design of the lysimeters was new, and the drainage cans for greenhouse work were the first of the kind. Perhaps the most useful invention is the artificial field plats, or "frames," which are intended for reducing experimental error in field experiments when plats must be used. These are described in a paper of which an abstract appears among those contained in this report.

Soil and crop surveys. In 1901 the first soil survey in New York was made by a field party from the Bureau of Soils of the United States Department of Agriculture. This initial area was small, being only 350 square miles, and was located in Chautauqua County. From that time until 1906 small areas were successively mapped in this manner by the Bureau of Soils in various parts of the State. Very shortly after the survey work was initiated, the College of Agriculture, through the Department of Agronomy, began to cooperate with the Bureau of Soils. This cooperation has been continuous, and at the present time the College is maintaining a trained soil surveyor in the field, with two part-time assistants.

In 1905 the first survey of an entire county (Tompkins) was finished, and the report was issued in 1906. The following counties were mapped and reports issued in the years designated: Tompkins, 1906; Madison,

1906; Niagara, 1906; Dutchess, 1907; Livingston, 1908; Montgomery, 1908; Washington, 1909; Ontario, 1909; Monroe, 1910; Jefferson, 1911; Orange, 1912; Oneida, 1913; Clinton, 1914; Chautauqua, 1914; Schoharie, 1915; Cortland, 1916; Yates, 1916; Saratoga, 1917; Oswego, 1917; Ulster, 1918; Rockland, 1918; Putnam, 1918; Westchester, 1918; Wayne, 1919; Tompkins, 1921; Cayuga, 1921; Genesee, 1922; Herkimer, 1923.

Columbia County (1923), St. Lawrence County (1924), and Essex County (1925), have been completed but publication has not as yet been made. Long Island is under survey at the present time (1926-27).

It may be said that about half of the total area of New York has been subjected to a soil survey. Considering only the more arable parts, probably three-fifths of such lands are mapped.

The field work of the soil survey is being supplemented by chemical analyses of representative soil types having agricultural value. This gives an inventory of the potential fertility of the various soils. In addition fertilizer- and lime-requirement tests are being made of the most important types by bringing to the College several tons of each soil and placing it in the field. The information obtained in these ways has been of much service to extension specialists in helping them to advise farmers in regard to the management of their soils.

During the past few years, field-crop surveys have followed the soil surveys. The data collected on the crop surveys are designed to furnish a general view of field-crop culture in the counties surveyed. With this in view a preliminary survey is made to establish the various agricultural areas, for it is found that in each county there are a number of sections in which the type of farming is different from that of the other sections. A study is then made of the kinds of crops, the acreage, and the management, including quantities of commercial fertilizers, lime, and manure used, and of the yields obtained as well as the nature of the crop rotations followed. These data are, so far as possible, correlated with the soil type. It is often found that certain soil types are particularly well adapted to the production of certain crops.

Not only do such data enable one to give a true picture of the agricultural situation on each soil area within a given county, but they also make possible the offering of practical suggestions in more than a hit-or-miss fashion. Moreover, the various soil areas may be compared and explanations offered as to the reasons for divergent practices in different parts of the same county. A practical soil and crop bulletin based on such knowledge and following up the more technical soil survey should be of great value not only to the individual farmer, but also to the extension specialist, who should be familiar with the agriculture and the agricultural needs of each county.

Outlying experimental fields. Field experiments of various types have been conducted on Caldwell Field at the College for more than thirty years and have yielded results valuable in a practical as well as in a technical way. However, the soil of the university farm (Dunkirk silty clay loam) is not of wide extent in the State, and the results obtained cannot be applied to the fertility problems of other and more important soil types except in a rather general way. In order, therefore, that more explicit information regarding the fertility responses of New York soils may be

ely be available, especially for the extension specialists, the College has committed itself to a policy of maintaining outlying experimental fields.

Results already obtained seem to justify such a development. The two fields already established, at Alfred and at Churchville, were secured under terms very advantageous to the College. The one at Alfred is leased from the Alfred University State School farm and was taken over in 1919, the first crop being grown in 1920. This field lies on Musia silt loam, a rather poor soil but one of considerable extent in south-New York. The ten acres at Churchville are a part of the property of the Cornell University Agricultural Experiment Station, having been purchased in 1919. The soil of this field is Ontario loam, perhaps the best of wide extent in central New York. The work here is very similar to that at Alfred. The fertilized rotation is corn, oats, clover, wheat, while the crop rotation is corn, oats, clover. The work with sunflowers and lettuce, so important at Alfred, is omitted at Churchville because these crops are not important in that section of the State. About two-thirds of the land on each field is being used for experimentation. Both fields are well equipped with sufficient machinery to handle all of the tillable area. The travel and maintenance funds allotted to the department for this work, however, are insufficient to permit the use of the total arable land of these fields. There is great need for additional funds if the Alfred and Churchville fields are to be utilized more intensively.

Preliminary experimentation with alfalfa and other crops was begun by this department at Geneva in 1925, on land made available by the New York State Agricultural Experiment Station. It is hoped that ultimately this work may be extended to a point where it will parallel that already under way at Alfred and at Churchville. The fact that the experiment station at Geneva is located on a soil type very important in Ontario County and in contiguous counties, makes it doubly important to establish an outlying field in that section. Moreover, the conditions, both economic and scientific, for carrying on the work will be particularly favorable if cooperation with the state experiment station can be arranged.

Similar fields in other agricultural regions of the State are needed in order to extend in a uniform way our knowledge of soil-fertility deficiencies. Three locations of particular importance are as follows: (1) in some part of the sandy-land region south or west of the Adirondack Mountains; of this region there is little knowledge that is of assistance in advising farmers; (2) in northern New York, probably in St. Lawrence County, where a study of forage-crop production in relation to dairy farming is now in demand; (3) in the red-soil areas of Chenango and Delaware Counties, the most important dairy region of the State. It would be desirable also to have a field in either Orange, Ulster, or Dutchess County, one in the Mohawk Valley, one in the Susquehanna Valley, and one in either Seneca or Washington County.

While the funds necessary to maintain in successful operation the two outlying fields already established are considerable, the practical information derived will ultimately be such as to make the investment worthwhile. It must be kept in mind that after sufficient data have been obtained in one location, this field may be discontinued and the funds used to operate a similar field in some other section of the State.

Animal Husbandry

In the field of animal breeding the development of the Holstein herd at the College during the past thirty-eight years stands out as a most instructive experiment and demonstration of the value of proved sires and an intelligent breeding program.

Among the early investigations in feeding, the experiments of Professor Roberts demonstrating the value of feeding grain on pasture should be mentioned for their large influence on feeding practice.

The investigators in the Department of Animal Husbandry early called their attention to the problem of rearing calves economically when skim milk is not available, and demonstrated the practicability of the use of reconstituted dry skimmilk, and later developed a formula for a calf ration which is being used widely both in this State and elsewhere.

In 1915 fundamental studies of the chemistry and physiology of animal nutrition were inaugurated by means of related experiments with both laboratory and farm animals. These studies have resulted in the following contributions to the knowledge of calcium and phosphorus metabolism: the establishment of the relationship between the calcium and phosphorus supply in the ration and the chemical and histological structures of the bones of growing animals; the demonstration of the bone changes resulting in "stiffness" in growing hogs; the demonstration that both sunlight and vitamin D aid calcification in growing pigs; the establishment of the relative value of various calcium and phosphorus carriers in the hog ration and of the principles governing their selection; and the demonstration of the relative value of clover and timothy rations in meeting the calcium and phosphorus needs for lactation in dairy cows.

Similar fundamental studies of protein metabolism have established the relative protein efficiency, for growth, of various grains and protein concentrates, have shown that rations based on clover and timothy hay have a similar protein efficiency for milk production, and have contributed to the knowledge of the influence of various planes of protein intake on lactation.

Botany

The researches of the Department of Botany cover a wide range. In taxonomy its most notable contribution is the *Flora of the Cayuga Lake Basin*. In plant anatomy a study of the phloem of woody plants has been completed, and emphasis is now being given to the study of floral anatomy as a criterion of relationship among the angiosperms. The cytological studies have dealt largely with chromosome structure and behavior in relation to inheritance. Part of this work has been correlated with that of the Department of Plant Breeding on inheritance in corn and other plants. In plant physiology there has been noteworthy work on the culture of orchid seedlings, yielding information on the use of organic nutrients by green plants. The nitrogen, iron, and manganese relations of green plants have been studied. Much has been done also in the study of transpiration in plants and of the translocation of organic and inorganic nutrients by woody plants. Studies in weed control and in paleobotany are under way.

Dairy Industry

From 1888 to 1895, the general subjects of the experimental work of the Department of Dairy Industry were: the methods of analyzing milk products for fat; the separation of fat from milk; and saving the fat of whey for the manufacture of whey butter. These practical experiments successfully answered the demands made upon the station by farmers and members of the dairy industry.

The years 1896 to 1898 were productive of no important publications but witnessed the beginning of extension work and remarkable increases in student enrollment. From 1899 to 1903, information was obtained experimentally upon which the experiment station based active opposition to the curd claims of manufacturers of certain patented forms of dilution separators. During this period, the sources of gas- and taint-producing bacteria in cheese curd were the subject of the first noteworthy bacteriological research. The work attracted favorable attention, and later investigations determined the cause and prevention ofropy milk.

In 1904 the present organization of the Department of Dairy Industry was effected. From 1904 to 1908, one of the outstanding achievements was the rectangle method of standardizing milk and cream to a definite fat content. This method was evolved by Dr. R. A. Pearson, then head of the department, and is so simple and effective that its use is universal today in place of the development of elaborate and often expensive tables and slides for accomplishing the same work.

During 1908 and the following years, some important departmental publications appeared which discussed such subjects as: the cell content of milk; yield and the moisture content of Cheddar cheese; moisture and salt in butter; metallic flavor in butter; bacteria in ice cream; variations in bacterial counts; and clarification of milk. Several books and manuals also were published by members of the staff, writing alone and as co-authors, on the subjects of: cheese making; butter making; ice cream; and milk products. In addition, articles from the department dealing with various problems of the industry appeared in scientific journals during these years. The decrease in student enrollment after 1920 resulted in marked increase of research activity, which has continued to the present time. During the past few years, conditions particularly favorable for experimental work have obtained in the department. The resulting publications prior to 1927 include the following subjects: the germicidal action of milk; comparison of the methylene-blue reductase test and the microscopic count; production of catalase by an anaerobic organism; studies of several anaerobic organisms; wheat and flour studies; accuracy of methods of sampling butter; proportioning ice-cream mix by algebra; and an economic study of dairy farmery organization. The publications of the year 1926-27 are abstracted in another section of this report.

Entomology and Limnology

The Department of Entomology and Limnology, in its more than fifty years of existence, has carried on an enormous amount of investigation dealing with all phases of insect life. The work on immediate economic problems is itself of great extent, and includes studies of fruit insects, no-

tably apple and cherry maggots and the fruit-tree leaf roller, a comprehensive study of insects and related pests attacking beans, and studies of insects attacking clover, cabbage, and ornamental plants. Extensive studies have been made of forest- and shade-tree insects, of poultry parasites, and of household pests. All of this has led to definite recommendations of control measures. Another division of the department deals with disease-bearing insects such as the mosquito. In the later years work in agriculture has been introduced, with research on the bacterial diseases of bees on various problems connected with winter conditions in the hive, and the relation of insecticides to pollination of fruit by bees. Associated with the work on insects in this department is that on fresh-water biology, particularly fish culture. This involves the direct study not only of fish, their food, their breeding, their diseases, but also of the insects and other animals and the plants upon which fish subsist.

Floriculture and Ornamental Horticulture

The investigational work of the Department of Floriculture and Ornamental Horticulture is of two major types—variety testing, and the study of the relation between varieties and environments with particular reference to cultural problems.

In conducting varietal studies, a survey is first made of all sales lists and garden literature, and, for this purpose, the department has a collection of sales catalogs and more than 3300 sales lists in its files. Organizations interested in different species, and nurseries, have cooperated in making available material for the study of the history of the varieties. The second phase of these studies is the comparison of the varieties under test conditions, as a result of which the varieties may be classified, the synonyms eliminated, and detailed descriptions made.

The study of the relation of varieties and environment is being carried on at present with gladiolus only. The effect of size of bulb, and of date and depth of planting, on the date of flowering and on the yield of flowers and bulbs, is under investigation. Studies are also under way on the culture of gladiolus under glass, the germination of gladiolus cormels and seed, and the breeding of a type of gladiolus suited to greenhouse forcing.

Forestry

The most important work in forest research in the Department of Forestry has been the establishment, in a number of localities in the State, of permanent sample plots in various types of forest. Here careful measurements are taken at intervals of five years, to study growth and yield and to obtain other silvicultural data that should in the end prove of great value. Already, after two and three remeasurements of some of these areas, data are in hand that throw needed light on certain problems about which much yet remains to be learned.

In the future, research activity will be centered chiefly on the Arden Forest, a woodland tract of nearly 2000 acres recently acquired by gift to the University. This forest contains extensive areas representative of the common forest types occurring on the important forest soils of southern and western New York. It is considered the function of forest re-

search at the College to develop silvicultural practice which will perpetuate and increase the productivity of New York woodlands.

During the coming year, studies will be initiated involving the establishment of a large number of permanent experimental sample plots illustrating a variety of cutting methods for the development and regeneration of the various types. When correlated with more exact ecological data, the development of these plots will constitute the basis for conclusions regarding the best silvicultural practices for these types.

There are very few exact ecological data concerning the principal forest types common to the farm woodlands of southern and western New York. Such exact studies concerning the habitual factors of the types, which are essential to the development of sound silvicultural practice, will be begun as soon as the required scientific instruments are available.

Plant Breeding

The contributions of the Department of Plant Breeding to agricultural science may best be presented under two heads, genetics and experimental methods.

Genetics. The mode of inheritance, interrelations in development, and linkages, of numerous qualitative and quantitative characters in corn, wheat, oats, and barley, have been determined. It is probable that more is known about the genetics of corn than of any other one plant, and more than of any other organism, plant or animal, except the fruit fly, *Drosophila*. These investigations have involved not only crosses between varieties of the same species, but also hybrids between the several species of oats, between the species of wheat, between wheat and rye, and between corn and teosinte.

One of the outstanding results of these studies is the synthetic production by hybridization of a type of emmer strikingly similar in its morphological characters, its chromosome complex, its pathological reactions, and its genetic behavior, to the wild wheat, or emmer, of Palestine. The most noteworthy contributions to genetics that have come out of the corn material are the partial elucidation of the nature and genetic behavior of variegated color patterns, an explanation of mosaic endosperm development, a solution of a problem involving apparently non-Mendelian ratios in endosperm characters, and the discovery that a single character of normal corn such as chlorophyll development is dependent upon the interaction of an almost unbelievably large number of genetic factors.

Many of the results of these studies are of practical use in the improvement of crop varieties. A knowledge of the mode of inheritance of particular characters is of the greatest value when it is desired to combine in one variety the valuable characters of two or more varieties.

In connection with the genetic studies of wheat and oats, a cytological study of the parent species, of their hybrids, and of extracted strains, has given valuable aid in the interpretation of results. This is particularly true of inter-specific hybrids the parents of which differ in chromosome numbers. Similar aid has been obtained in the genetic studies of corn from cytological work done in the Department of Botany.

Experimental methods. The department has had a prominent part in the influencing of experiment-station workers to employ the methods of

biometric analysis in the planning of experiments and in the interpretation of results. It has been a leader in the development of practical and practicable methods of testing on a large scale the varieties and strains of small grains. The rod-row system of testing such materials, now in general use in this country and coming to be used in other countries, is largely a development of this department. Here also a method of breeding timothy was first worked out. In addition, this department was perhaps the first to devise a practicable method of potato improvement by tuber- and hill-unit selection, a method which is now being used by seed growers of this and other States and by investigators of other stations. Studies of methods of field-plot technic with small grains, corn, timothy, and potatoes by this department have exerted an important influence toward the use of more care in crop tests.

Plant Pathology

Of a total of 524 publications from the Department of Plant Pathology 263, or 50 per cent, have related specifically to the results of investigation. The life histories of many disease-producing organisms have been determined and the foundations have thus been laid for the development of control practices. The bean industry of the State, threatened by diseases and insect pests, was saved and to date partially restored through the efforts of college research men working jointly with investigators from the Departments of Plant Breeding and Entomology. New varieties of beans, resistant to diseases, have been developed. The work is being continued looking to the control of bacterial blight which is now the most important disease of this crop. The modified dry-formaldehyde method of controlling loose smut of oats, now generally practiced, was developed here. Progress is being made in such fundamental studies as the nature of parasitism and resistance, the relation of nutrition to infection, the nature of fungicidal action, and the development of a general soil disinfectant.

Although more attention to diseases of ornamental plants has been given at Cornell than at any other institution, this field remains largely neglected. It is felt that the floriculture and horticulture industry in the State is sufficiently important, and the problems are sufficiently acute, to warrant an intensive investigation; and with the industry rapidly developing in this country, because of plant quarantines which are eliminating the supply of materials from abroad, there is certain to result an increased demand for information on disease control. This work should be initiated at once.

Throughout its existence this department has been favored by the support, cooperation, and confidence of growers, who have realized the significance of the application of science to their practical problems. As material evidence of this support, organizations of growers have established twenty-two industrial fellowships, contributing approximately \$40,000, for the investigation of their plant-disease problems. In addition, more than \$60,000 has been contributed by commercial concerns in establishing thirteen fellowships for the study of the value of materials to be used as fungicides. These fellowships have made possible the study of certain important problems for which state support has been inadequate, have given needed financial support to 37 graduate students, of whom 19 have received the doctorate, and have led to the publication of sixty-five scientific publications of merit. The average length of the

wships has been two years, and the average annual salary paid the fellow \$683. At present there are in operation four fellowships, as follows: the Bayer fellowship, in its fourth year, established by the Bayer Chemical Company and providing for the study of the fungicidal value of organic mercury compounds in the control of seedling diseases of conifers; the Champlain Valley fellowship, in its second year, established by the Champlain Valley Fruit Growers Association for the study of fruit- and blotch-spot diseases of apples in the Champlain Valley; the Western New York Farms Corporation fellowship, in its third year, established by truck growers in Orleans and Genesee Counties for the study of diseases of muck crops; and the Williamson Cooperative Vegetable Growers Association fellowship, now in its tenth year, established by growers for the study of diseases of muck crops. The importance of disease control, and the evidence that the State has not been too generous in its support of the work of the department, are indicated from the additional support which has come from farmers.

Some valuable contributions have been made by these fellows working under the direction of our permanent staff. Many of the methods now widely used by farmers in controlling diseases were developed and demonstrated by fellows working in the orchards or the fields of growers. A recent discovery that unproductive muck may be made productive through the addition of a small amount of copper to the soil will greatly increase crops and the value of muck land in New York. An investment of approximately \$3000, and this by growers, led to this important discovery. Its importance is hard to estimate, but may conceivably reach into the millions. In three years, and at an investment of \$3500 by the Williamson Cooperative Vegetable Growers Association, \$35,000 was saved to the growers through the control of onion smut. This work was incidental to disease studies for which the fellowship was established. The experimental and demonstrational evidence warranting the replacement of Bordeaux mixture by lime-sulfur in the control of fruit diseases was obtained through a relatively small investment in a fellowship, as was the pioneer work on dusting which has partially replaced spraying. There is nothing unusual about these examples so far as the relatively large returns from small investments in plant pathology are concerned; they are cited because the amount invested under the circumstances is readily calculated, and with the fellow devoting his time to a specific problem of a practical nature the returns from the study are more easily arrived at than in instances in which problems of a more fundamental nature are undertaken or the worker divides his time between several pieces of work.

Although it is true that the major part of the research has related to problems of pressing economic importance, a relatively large amount of work of a fundamental nature has been done. Such work is absolutely essential for progress, and the results to be obtained are vital to the existence of the science as such. Often the most direct approach to economic problems is through the so-called fundamental field, which frequently may properly be defined as the laboratory type of work. Unfortunately, support for this sort of experimentation is not easily obtained and the development has thus been somewhat retarded.

Pomology

Earlier contributions by the former Department of Horticulture concerned with the development of spraying, laid the foundation for the more technical work now done by departments dealing with diseases and insects. Valuable work was done also, in the earlier years, on problems dealing with the barrenness of the orchards, and some important contributions were made to the knowledge of pollination requirements of pears. General theories were formulated as a basis for the practice of intensive orchard cultivation, and as a result the sod orchards began to give way to more productive cultivated orchards. The orchard surveys of the important counties in the fruit sections of the State have served as an example for many other similar surveys in other parts of the country. The results of these surveys have proved to be helpful in the teaching and extension work, and have served as a basis for further investigation.

More recently the study of the responses of the young trees to pruning has shown that heavy pruning as compared with light pruning dwarfs the trees, causing them to bear several years later and to produce smaller crops during their early life. As a result of this investigation and the effective extension work along this line, moderate pruning has been generally adopted in the State during the past ten years, resulting in more profitable production for orchards under fifteen years of age.

Investigation of winter injury of fruit trees has given a basis for recommending practice tending to reduce the heavy damage from cold. By applying the results of studies carried on in pomology pointing to the importance of tree vigor and to the need for cross-pollination, the uncertainties attending the set of fruit after blossoms have appeared in the spring can now be avoided to some extent. As a result of the cooperative work of the Departments of Agronomy and Pomology, it has been clearly demonstrated that grass interferes with the nitrogen supply of fruit trees and that cultivation is of primary importance in making available the necessary nitrogen which is generally found in the good fruit soils of the State. These facts have made it possible to place emphasis on plowing during May or June to destroy grass and weeds, rather than on frequent cultivation throughout the summer to form a mulch for the purpose of conserving soil moisture. This modification in practice reduces the cost of production and also insures a better cover crop, which, in turn, tends to give more desirable color to the fruit and also a tree more resistant to winter injury. Since we now know that grass interferes primarily with the nitrogen supply of the tree, we are in a position to recommend the application of nitrogenous fertilizer for uncultivated orchards whenever economic conditions justify this further modification. Investigation of the metabolic processes of fruit harvested at different periods and of exact freezing temperatures of the apple has afforded a scientific basis for the handling of fruit intended for cold storage. The application of the studies helps to reduce large losses from scald and other non-parasitic troubles which cause premature breakdown.

Poultry Husbandry

The Department of Poultry Husbandry is endeavoring to solve through research the following problems in the poultry industry:

- (1) The mode of inheritance of egg and meat production, color, pa-

ern, and type, through a knowledge of which the efficiency of poultry may be greatly increased.

(2) The causes and the prevention of infertility and low hatching quality of eggs, which sometimes cause great economic waste.

(3) The adequate development of practical and scientific systems of ventilation of poultry buildings, to meet an important need in overcoming serious handicap in the northern States.

(4) The production and environmental conditions influencing the interior and the exterior quality of eggs and affecting their food value and hatching quality. This is the key to the question of law enforcement in the grading and marketing of eggs, important alike to producers, distributors, consumers, and law-enforcement agencies.

(5) The actual and the relative importance of the various physical characteristics of poultry as indicating their past and their future production value. The newer knowledge on judging birds for production is revolutionizing the breeding of poultry.

(6) The differences in feeding value of the different kinds of proteins, minerals, fats, and other food nutrients, in the production of eggs and the growth of poultry. The feeding of poultry has undergone more radical changes due to scientific discovery during the past five years than in the previous twenty-five years.

(7) The relation of sunlight, incandescent light, and ultra-violet light, to poultry and egg production. Startling discoveries have been made which have great economic value in the keeping of poultry.

(8) The energy and heat requirements of poultry, a corollary of scientific feeding.

(9) The development of synthetic or artificial diets for use in poultry-feeding experiments, an important foundation step to unlock scientific discoveries in feeding.

(10) The effects of inheritance on nutrition, an important check to insure accuracy in handling feeding experiments.

(11) Control of purity of air, humidity, temperature, and turning, and other environmental conditions involved in the successful hatching of eggs. This should establish the foundation upon which to build successful incubation practice and the construction of incubators. It attacks a problem which has never been adequately investigated, and which, when solved, will reduce the present serious losses in hatching chickens.

Rural Social Organization

Since 1920, half of the time of two professors and an assistant in the department of Rural Social Organization has been given to research, for it has been realized that no advance will be possible, either in instruction or in the organization of rural society through extension work, until there is built up a knowledge of the structure and the processes of rural society through scientific investigation of these phenomena.

The geographical basis of rural society in the neighborhood and the community was first studied in a survey of Otsego County, the results of which were published in Bulletin 422 of this experiment station in July, 1923, *The Social Areas of Otsego County*. The practical application

of this study was shown in the recommendation of the Committee Twenty-one for the adoption of a community unit for school administration. Together with similar studies in other States, this one has given a better understanding of the geographical basis of rural social organization. A similar study is now being undertaken in Schuyler County.

The next important investigation in the department was that of the farmer's standard of life, made in Livingston County in 1921-22, the results of which were published in Bulletin 423 of this station in January, 1923, under the title *The Standard of Life in a Typical Section of Diversified Farming*. This was the first study of its kind ever made, and was an attempt to provide a method of measurement of the standard of life in a culture, for the comparison of that of one community or group of people with that of another. It has resulted in a series of similar studies being made in many States in cooperation with the United States Department of Agriculture, and the accumulation of a large body of data and the gradual development of a technic for the adequate analysis of the complicated phenomena involved in the nonfinancial aspects of the standard of life. A similar study was made in Schoharie County in 1924 and a preliminary report has been issued in mimeographed form by the United States Department of Agriculture (May, 1925) under the title *Living Conditions and Family Living in Farm Homes in Schoharie County, New York*. The final completion of this study has been delayed but will be completed for publication this summer, and will show very important advances in the method of measurement of the standard of life through the development of a synthetic index obtained through a statistical analysis of the more important factors entering into the standard of life by means of multiple correlations. Both of these studies were carried on in cooperation with the Bureau of Agricultural Economics of the United States Department of Agriculture.

As one phase of the standard of life, a study of sickness and medical service in the farm homes of three townships in Cortland County was made during the period from 1923 to 1925, the report of which was prepared during the past year and is now in process of publication. This study showed the actual amount of sickness and the cost of medical service and other costs for the maintenance of health for a year, and gave the financial data for consideration of the economic problems involved in adequate medical service for farm homes. Incidentally, data were gathered concerning the composition and the mobility of the population of these three townships particularly with regard to differences of age groupings between the small villages and the farms, and the nativity and marital status of those on farms and in villages, and these are being published in a separate bulletin. A very high percentage of old people and a lack of youths and children were found in the small villages, indicating the need of further study of the populations of small villages, for they form the social centers of the majority of the rural communities of the State and if they are dominated by the aged a very decided limitation of the development of rural social institutions may result.

For the past three years the principal research project has been a study of the rural population of New York from 1855 to 1925, and of the relation of the size of villages to the number and the kind of service agencies which

maintain. This study grew out of the necessity of determining the number and the size of the villages of the State, and their relation to the urban and farm populations. It has resulted in a very complete analysis of the trends of rural population in different sections of New York State, and a better understanding of the diverse elements which are grouped in the census under the term *rural*. It shows also, for the first time, the number and the size of all the villages of the State, unincorporated as well as incorporated, revealing the significant fact that half of the village centers in the State are unincorporated villages of from 50 to 250 inhabitants. The study shows further that, although the crude figures of the census would indicate a loss in population by villages in many decades, a more careful analysis makes clear that the villages have actually gained in population and that the apparent loss in population as a group has been due to the growth of many of the villages into larger towns. This study of the rural population is now ready for publication. The data of the second phase of the study, on the relation of service agencies to the villages of various sizes, are now being tabulated and will be completed for publication this year. This study should show the size of village which supports a given type and number of service agencies, economic and social, such as stores of various sorts, banks, professions, fraternal organizations, churches, schools, and so forth.

During the past two years an assistant has made a careful survey of the social organization of the town of Caroline, Tompkins County, and this will soon be ready for publication. This study reveals the increasing influence of the city of Ithaca on the life of the countryside, and the relative decline of the villages as social centers. This increasing urbanization raises very important problems with regard to the satisfactory social organization of rural areas within the sphere of influence of cities.

In 1920, members of the departmental staff made a survey of the rural churches of Tompkins County for the Interchurch World Movement, which was incorporated in a report of the Institute of Social and Religious Research entitled *The Country Church in Colonial Counties*.

Other investigations conducted by members of the departmental staff, but not published, include a study of recreation of rural school children and a study of community buildings in New York State.

Vegetable Gardening

The most important contributions made by the Department of Vegetable Gardening are the results from studies of the following problems: (1) the transplanting of vegetable plants; (2) tomato nutrition; (3) cultivation of vegetable crops; (4) suckering sweet corn; (5) pollination of tomatoes; (6) celery storage; (7) premature development of the seed stalk of celery. The results of these studies have contributed to the solution of important practical problems in vegetable production and handling, and also to a better understanding of the principles involved. Some of these studies are important contributions to the knowledge of nutrition and reproduction in plants, and of other physiological and chemical processes. Other studies have furnished valuable data on the factors affecting yield, cost of production, and returns, of potatoes, tomatoes, peas, sweet corn, and beans. Marked changes in practice in vegetable

production and handling have been brought about as a result of research on most of the problems mentioned.

A large part of the present program is concerned with the following projects: (1) cultivation experiments with vegetables; (2) a study of the causes of premature seeding in celery and in cabbage; (3) experiments with suckering sweet corn; (4) a study of the relation of soil reaction to the growth of several vegetable crops; (5) tomato nutrition (field and laboratory); (6) tomato fertilizer and manure experiments; (7) studies with green manures and cover crops; (8) asparagus fertilizer experiments; (9) selecting and breeding of sweet corn to reduce or eliminate suckers; (10) studies of ecological factors affecting the tuber set and the yield of potatoes; (11) the influence of soil type on the value of potatoes for seed; (12) varieties and types of celery; (13) fertilizer experiments with field beans. All of these studies and experiments are so planned and conducted as to give results of value in the solution of practical problems and at the same time to yield important scientific data.

The Long Island vegetable research farm

The work of the Long Island vegetable research farm during the past year has been almost entirely a continuation of the work previously started. This report, by the officer in charge, Professor P. H. Wessels, is therefore a report of progress on the various experiments that are being conducted with reference to soil fertility and vegetable-crop production, the particular phases being dealt with as a part of the college program. Important studies in entomology and plant pathology are covered in the report of the State Experiment Station at Geneva.

Cultivation experiments. The cultivation experiments bear out the findings of Professor H. C. Thompson, and show that, under the local conditions of soil and climate, weed control is the chief purpose of cultivation. Although these experiments parallel that conducted at Ithaca, the importance of cultivation in the growing of crops and the reluctance of farmers to abandon established practices make it desirable to continue them. With the increased facilities for laboratory work since electric current became available to the research farm, there is an opportunity to make a more thorough study of the effect of cultivation on the moisture content of the soil; and both soil and rainfall differ from the conditions at Ithaca. This year the farm has substituted cauliflower for early cabbage, and potatoes for celery, and it contemplates using other crops when work on the present crops has progressed sufficiently.

Sweet corn is an important crop on Long Island, especially in Nassau County where the practice of removing the suckers is followed. The results with three varieties—Golden Bantam, Stowell's Evergreen, and Long Island Beauty—have failed to show any gain from the removal of suckers, but the growers are unconvinced, and so the farm is continuing the work, using only the Long Island Beauty. In this connection an attempt has been made to develop a non-suckering strain of Long Island Beauty sweet corn by plant-breeding methods, and there is a prospect of achieving that end.

Fertilizer experiments. One series of fertilizer plots for growing peas, beets, and spinach, followed by late cauliflower, has been utilized this year.

se plots had previously been used for tomatoes, but increase in diseases through lack of rotation made it advisable to change to other crops. The plots obtained with the peas, beets, and spinach show marked differences in response to the amounts of the various fertilizer elements. As beets and spinach are crops which are sensitive to soil acidity, one-half of each was limed. About three times as much crop was produced on the limed as on the unlimed part of the plot. The value of manure in overcoming unfavorable soil conditions was brought out on these plots, as the limed part of the manured plots produced about two-thirds as much as the limed part of these same plots.

The other fertilizer plots are in asparagus. This is the first full season of cutting. The importance of nitrogen for asparagus is already apparent on these plots.

More plots for fertilizer studies are needed, and as soon as the study of the uniformity of the soil on blocks 7 and 8 is concluded these areas will be devoted to this work, thus giving an opportunity for crop rotations in connection with the fertilizer studies.

Soil-acidity studies. Soil reaction is an important factor in crop production. This is especially true on Long Island where potatoes and cauliflower are the two important crops. A series of plots is maintained on which the reaction has been changed by applications of sulfur and of lime so that there are varying degrees of acidity, thus giving an indication of the reaction most favorable for the various crops. Potatoes are being grown on these plots this year, and marked differences in the growth are apparent. While a certain degree of acidity is essential to the production of "clean" potatoes, the yield is much depressed by an excess of acidity. These plots will furnish an indication of the most favorable reaction for the production of scab-free potatoes, and will show whether there is a reaction most favorable for both potatoes and cauliflower. The plots will be planted with cauliflower next season. As soon as practicable, another series of plots will be established so that crops may be rotated and results obtained more readily.

Cover crops and green manures. The effects of cover crops and green manures are being studied on two series of plots. No definite results have been obtained as yet. Probably a change in the soil reaction would bring about marked differences in the plots devoted to the various crops used, but it has been thought best to await the results of the soil-acidity work before making any decided change in the reaction of this soil.

Variety and strain tests. The variety and strain tests will be conducted largely in connection with other experiments. Cauliflower strain tests may possibly be continued separately for a time, owing to the importance of the crop and the number of strains that are of interest to the grower; but the tests of other vegetables will be handled by using a few strains at a time when planting the plots in the various experiments.

Size-of-plot studies. The work on size of plots has been carried on since the establishing of the research farm. Two blocks of approximately five acres each have been devoted to this study, which is fundamental to field-work. The results have been tabulated, and it is expected to complete the study of the results in time to decide on the best layout of plots on one of the blocks this winter so that more plots may be available for fertilizer

and soil-acidity studies next year. Too often plots have been laid out without any preliminary study of the soil variation. It appears desirable to continue this work on one block for a while longer, in order that additional results may be obtained and also that there may be some land in reserve for future needs.

Miscellaneous experiments. From time to time, minor questions arise which are not sufficiently important to be given a great deal of attention but which are of some interest. When these cannot be answered in connection with experiments already under way, the marginal land at the ends of the blocks can be used for them. The study of crow repellents is an example of such work.

Greenhouse work. The greenhouse is used to continue the same line of work as are carried out on the plots. Conditions are under better control and more treatments can be handled than in the field, where the necessity for replications of plots limits the number of treatments that can be used.

Needs of the research farm. The appropriations have provided for most of the needs of the farm, and the equipment is accumulating to the point where the proper housing of the machinery is one of the most pressing requirements. The machine shed that was on the farm when purchased is small, poorly constructed, and greatly in need of repairs. A machine shed of ample size to house the machinery and to provide space for a workroom is the greatest present need.

As more plots are laid out, more labor is involved in taking care of them and in harvesting the crops and getting the records.

An addition to the dwelling house to provide an extra bedroom on each floor is highly desirable. During the course of the year the research farm has a number of visitors. Suitable hotel accommodations in Riverhead are lacking, and moreover Riverhead is five miles away. It is necessary that the farm provide some accommodations for official guests. The construction of the house is such that an addition could be made by building two and one-half sides.

Bulletins and papers published during the year

The following report and abstracts of articles published during the year by members of the several departments give at least some idea of the results of the research work which has been brought to the point of publication. There is, of course, a vast amount of such work in progress which is not yet ready for presentation in published form and which it is impossible even to mention in the limited space of this report.

Agricultural Economics and Farm Management

Farm Economics is published monthly by the Department of Agricultural Economics and Farm Management. During the past year pages 457 to 712 were printed. They include brief statements which are of direct importance to farmers, based on research work in the department. Some of the material will be published in full in bulletins.

Additional research publications by members of the departmental staff are listed below.

Roger B. Corbett — An economic study concerning the operations of fruit and vegetable shippers in western New York. Cornell Univ. Agr. Exp. Sta. B. 453. 1926.

Records of purchases, sales, and costs of handling of apples, peaches, pears, and cabbage for two seasons (1922-23 and 1923-24) were obtained from a number of firms in western New York. In the first season, 70.50 per cent of the net sales was returned to growers for produce purchased. The gross margin was 29.50 per cent of the net sales, handling costs were 27.99 per cent, and proprietors' salaries and profits were 1.51 per cent. Interest on the proprietor's investment was included in handling costs. In the second season, 92.59 per cent of the net sales was paid for produce bought, and handling costs amounted to 27.67 per cent. The proprietors suffered a net loss of \$95,955.03, which was equal to 20.26 per cent of the net sales. In the first season there was a profit on barreled apples, pears, and cabbage, but losses on bushel apples and peaches. In the second season losses were suffered on all kinds of produce. In both seasons the returns on f. o. b. sales were much more satisfactory than those on the joint-account or consignment sales. This was due in part to the poorer quality of the produce shipped on joint-account or on consignment, and in part to the fact that these methods of sale were resorted to more largely when the markets were weak.

Slade Kendrick — An index number of farm taxes in New York, and its relation to various other economic factors. Cornell Univ. Agr. Exp. Sta. Bul. 457. 1926.

This index number was prepared in order to have a measure of farm taxes with which farm prices, general prices, wages, value of land, and other economic factors could be compared. Farm taxes on general property were measured by years from 1887 to 1924. When 1887 is called 55, taxes in 1924 were exactly four times as great. During these thirty-eight years the movement of farm taxes was upward, but during the latter part of the period their rate of growth increased. When 1910 to 1914 is called 100, taxes were 220 in 1924. In the period studied, the percentage of farm taxes taken for state purposes declined from 24.0 per cent in 1887 to 5.4 per cent in 1924. The percentage of school taxes rose from 21.8 to 27.5. The share of the township grew more than did the share of the school. Township taxes were 24.4 per cent of all farm taxes in 1887, and 44.1 per cent in 1924. Thus 71.6 per cent of farm taxes in 1924 went to the local school and the township. County taxes declined from 29.8 per cent in 1887 to 22.0 per cent in 1924. Both assessed value and census value of farm property rose from 1887 to 1924, but not nearly so much as did taxes. Increases in salaries of teachers, wages, and prices were found to give part of the explanation of rising taxes. State aid to schools in relation to school taxes was examined from 1887 to 1902 and from 1911 to 1924. It was found that in spite of higher educational standards imposed by the State and increasing recognition of education as a public function, the maintenance of rural schools was less of a State function, on an average, in the period from 1911 to 1924 than in the earlier years 1887 to 1902. City taxes on property as a rule were higher than farm taxes, but taxes in New York City were much lower than farm taxes. From 1915 to 1924, general property taxes per \$1000 of estimated full value increased much more in the country than in the city. School taxes in the city were much higher than in the country. Likewise increases in state aid to schools were much greater in the city than in the country.

G. Misner — Economic studies of dairy farming in New York. VI. Grade B milk with cash crops and mixed hay roughage, crop year 1922. Cornell Univ. Agr. Exp. Sta. Bul. 452. 1926.

The results of a study of the organization of dairy farms producing cultivated cash crops and having ordinary mixed hay for roughage for the crop year 1922 are reported in this bulletin. The results for the same farms for the crop year 1921 were reported in Bulletin 441 of this station.

The average labor income of eighty-eight farmers for the year was \$32. The farm income was 27.3 per cent less than in the preceding year. In 1922 forty farmers failed to make interest, thirty-three made labor incomes of from \$1 to \$1000, and fifteen made labor incomes of over \$1000. The winter dairies returned the most per hour of labor, averaging 28.4 cents per hour as compared with 13.3 cents for the summer dairies.

- E. G. Misner — Economic studies of dairy farming in New York. VII. Grade milk with cash crops and mixed hay roughage, crop year 1923. Cornell Univ. Agr. Exp. Sta. Bul. 455. 1926.

This bulletin reports the results of the study of dairy farm organization and the cost of milk production for the third consecutive year. The average labor income for ninety-five farms was \$383. Of these farms, thirty-three failed to make interest, thirty-eight made labor incomes of from \$1 to \$1000, and twenty-four made labor incomes of more than \$1000. The return per hour of labor in winter dairies was 12.7 cents and in summer dairies 9.9 cents.

In this bulletin and also in Bulletin 452 are included tables summarizing the uses of fertilizers, lime, and manure for different crops. Tables showing the details of the cost of producing milk, the crops grown, and important business factors for each farm studied, are given. Each bulletin has a tabulated summary giving the average of each important factor for the year.

Agronomy

- J. A. Bizzell and T. L. Lyon — Composition of drainage waters from lysimeters. Cornell University. Presented at the International Congress of Soil Science, Washington, D. C., June 13-22, 1927.

The lysimeters used in these experiments consist of waterproofed concrete tanks approximately 4 feet square and 4 feet deep. Each tank was filled with a clay loam soil.

Calcium in the drainage water from the unplanted soil was greater than in the drainage water and the crops combined from the planted tanks. Applications of lime had no appreciable effect on the amount of calcium in the drainage water, while applications of potassium sulfate increased the amount. Magnesium in the drainage water was decreased by cropping. Applications of lime increased the total amount and concentration of magnesium, as did also applications of potassium sulfate. Potassium was removed in smaller quantity from the drainage water than by crops, in which respect it differed from calcium and magnesium. Applications of lime had no appreciable effect on the amount and concentration of potassium in the drainage water, and potassium sulfate also was without effect. Two-thirds of the sulfur added as potassium sulfate was recovered in the drainage. There has never been more than a trace of phosphorus in the drainage water from these tanks.

- T. L. Lyon — Nitrates in soils as influenced by the growth of plants. Amer. Soc. Agron. Journ. 18:834-840. 1926.

The influence of the incorporation of the entire plant and of crop residues on the accumulation of nitrates in soil is first discussed. Various factors that help to determine the rate and the amount of nitrate accumulation are considered. Among these are the age of the plants, the nitrogen content, the relative effects of legumes and nonlegumes, the nitrogen-carbon ratio, and the effect of carbonaceous material on the decomposition of highly nitrogenous substances. The relation of the nitrogen-carbon ratio of the decomposing material to the length of the incubation period also is discussed. The second part of the paper is concerned with the influence of living plants on nitrogen transformations in the soil. A number of cases are cited in which there has occurred a disappearance of nitrate nitrogen in soil which could not be attributed to absorption by plant roots. This is explained as being due to the liberation of carbonaceous matter by roots of living plants, which material furnishes energy for nitrate-nitrogen-consuming organisms, with a consequent conversion of nitrate nitrogen into other forms. This interferes with the absorption of nitrogen by growing plants, but it also diminishes the loss by leaching.

- T. L. Lyon — Legumes and grasses in crop rotation. Amer. Soc. Agron. Journ. 19:534-545. 1927.

The paper discusses the effects of legumes and grasses on the growth of succeeding crops as found by experiments conducted at various experiment stations as well as at the Cornell University station. As a rule the legumes have proved to be better than grass in their effect on the yield of the first crop following the hay. The question whether the beneficial effect of red clover is due to its properties as a legume or to the growing of crops in a rotation is discussed.

with the conclusion that rotation alone will not account for the entire benefit derived from legumes. The growth of legumes for green manures is shown by a majority of the experiments to be preferable to the use of non-legumes for the same purpose. Experiments in which an annual legume was used to replace a cereal in a crop rotation indicate that a practical advantage is to be gained by the succeeding crop from replacing oats by soybeans. Mixtures of corn and soybeans showed no advantage over corn alone, but mixtures of oats and field peas proved to be more productive than oats alone. Furthermore, the growing of these mixtures appears to aid the crops that follow.

L. Lyon and J. A. Bizzell—Nitrogen economy in Dunkirk silty clay loam. Presented at the International Congress of Soil Science, Washington, D. C., June 13-22, 1927.

The lysimeters used in the experiment consist of waterproofed concrete tanks 4 feet 2 inches square and about the same depth. Nitrogen was determined in the manure applied, in the rainfall, in the crops removed, and in the drainage water, also in the soil at the beginning and at the end of the experiment.

A large discrepancy was found between the total loss of nitrogen and the removal in crops and drainage. Attention is called to the need for studying the conditions which influence this loss. There was considerable fixation of nitrogen by the legumes. This amounted to an annual average acquisition of 54 pounds on the unlimed soil and 71 pounds on the limed soil. A disappearance of nitrate nitrogen in cropped soil was noted, as in previous experiments by the authors and others.

In the mixed cultures of legumes and nonlegumes, the yield of nitrogen in the nonlegume crops was nearly as great as in the same nonlegumes grown alone. This was taken to indicate that the nonlegume benefits from the legume.

L. Lyon and E. W. Leland—Artificial plats for field experiments. Amer. Soc. Agron. Journ. 18:596-602. 1926.

A description is given of a kind of field plat intended to reduce the experimental error in soil-fertility experiments. The plats are bounded by concrete walls which constitute the four sides. Since the constructed part consists only of walls, the bottom, or floor, is formed by the subsoil, the surface soil having been removed before the walls were built. The surface taken from where a set of artificial plats, or "frames," are to be built is mixed thoroughly and returned to the "frames" after they are finished. This gives a uniform soil in the surface 8 inches. No attempt is made to make the subsoil more uniform, and consequently the use of "frames" is recommended only for soils having rather compact subsoils and situated in the eastern States where the subsoils are less porous and fertile than they are farther west. The "frames" are of various sizes, the largest being 0.001 acre in area and the smallest 0.0001 acre. A three-years test to determine the experimental error on four sets of fourteen plats each resulted in finding a range of ± 2.14 to ± 2.61 per cent of the mean yield of any pair of duplicate "frames."

K. Wilson—Legume bacteria population of the soil. Amer. Soc. Agron. Journ. 18:911-919. 1926.

In conducting this piece of work, soil samples were collected from fields where the crop history for a number of years was known. These samples were examined for legume bacteria of different groups of host plants. Definite portions of the soil were used as inoculation material for sterilized soil which was prepared either in large test tubes or in glass tumblers. Seeds of the desired host plant, after proper treatment to remove any adhering legume bacteria, were planted in these soils. The containers holding these planted soils were placed in running water so that favorable conditions for nodulation would be maintained. After proper intervals of growth the plant roots were examined for nodules. The presence or the absence of nodules on the roots was the criterion of the number of legume bacteria in the soil. Soil thus handled showed a wide variation in the number of legume bacteria. For alfalfa the number ranged from none in 5 grams to 100,000 per gram. A soil with a reaction further from neutrality than pH 6.5 does not support as large a number of legume organisms capable of producing nodules on alfalfa, as does a soil with a reaction nearer neutrality than this figure indicates. The growth

of the legume organism for *Trifolium repens* seemed to be reduced in soil with a reaction of about pH 6.0. In a soil that had a reaction of pH 5.4 there were only about 50 organisms per gram, while one with a reaction of pH 6.2 had more than 1,000,000 per gram. The moisture content of these two soils was not the same and this may account for some of the difference. Soil with a reaction of pH 6.2 contained a larger number of organisms capable of producing nodules on *Dalea* than did one with a reaction of pH 5.4. One soil with pH 5.4 contained more than 100,000 bacteria per gram for each of two groups. These were soybean and vetch.

- J. K. Wilson — The number of ammonia-oxidizing organisms in soils. Presented at the International Congress of Soil Science, Washington, D. C., June 13-15, 1927.

This is a report on the number of ammonia-oxidizing organisms in soil determined by introducing definite portions of a soil into media free from nitrites and nitrates. After proper intervals of incubation the presence or absence of nitrites is determined. The results indicate that soils vary in the number of organisms which oxidize ammonia to nitrites, and that this variation runs parallel with the reaction of the soil.

- J. K. Wilson and T. L. Lyon — The growth of certain microorganisms in planted and in unplanted soil. Cornell Univ. Agr. Exp. Sta. Memoir 103. 1926.

This work was conducted to determine the influence that a growing plant might have on the development of certain soil organisms. Soil was placed in large tubes, and after these had been heated in an autoclave and inoculated with pure cultures of selected organisms, sterilized seeds of maize or timothy were planted in some of the tubes while other tubes remained unplanted. After the plants had grown for periods varying from several days to a few weeks the soil was removed from both the planted and the unplanted tubes. Infusions were plated, and colonies were counted after incubation. With few exceptions the soil in which plants were growing contained a larger number of organisms than did the unplanted soil. The organisms used were in every case those known to be active in changing nitrogen from one form to another. The conclusion is drawn that at least some crop plants produce a condition in the soil surrounding their roots which favors the growth of certain microorganisms that consume nitrate nitrogen, thus accounting for the disappearance of nitrogen not absorbed by the plants.

Animal Husbandry

- L. A. Maynard and R. C. Miller — Calcification studies with pigs fed different protein supplements. Amer. Journ. Physics 79:615. 1927.

In studies with growing swine, using the ash content of the femurs as a measure of calcification, it was found that better calcification was caused by a ration containing fish meal as the protein supplement and also by a ration containing blood meal and casein as the supplements than by a ration containing linseed-oil meal as the supplement. All of these rations were similar as to their content of calcium and phosphorus, which were supplied in approximately a 1:1 ratio, ground limestone and bone meal being used to help provide the minerals in the oilmeal ration and the casein-blood-meal ration. All three rations caused rapid and nearly equal growth, but the oil-meal ration was slightly surpassed by the other two in this respect. With a fourth ration identical with the casein-blood-meal ration with the exception that its calcium content was greatly lowered and its phosphorus content slightly lowered by omission of the mineral supplements, the rate of growth was nearly equal to that caused by the same ration with the mineral supplements, but the ash content of the femurs was approximately 35 per cent less and the characteristic external symptoms of inadequate mineral nutrition developed.

- L. A. Maynard and R. C. Miller — Studies of the influence of menhaden-fish meal on calcification in growing animals. Cornell Univ. Agr. Exp. Sta. Memoir 104. 1927.

This publication reports in a more comprehensive way and cites certain additions to the experimental work described in the preceding and the following publication.

C. Miller and L. A. Maynard — Calcification studies with rats fed menhaden oil and various menhaden-fish meals. Amer. Journ. Physics 79:626. 1927.

Studies are reported with growing rats, using the ash content of the leg bones as the measure of calcification, from which it is concluded that menhaden-fish meal and menhaden oil contain the specific factor aiding calcification.

Botany

Wm. Aslander — Chlorates as plant poisons. (A preliminary report.) Amer. Soc. Agron. Journ. 18:1101-1102. 1926.

By applying a 10-per-cent solution of sodium chlorate in autumn, after the frost had killed the tops of the vegetation, it was found that moderate application killed *Cirsium arvense* (Canada thistle) during the winter.

C. Muenscher — Keys to woody plants, 2d ed. 1926.

The purpose of this booklet is to aid the beginner to identify woody plants in the summer and the winter condition. It is similar to the first edition, but it is revised, the keys are rearranged, and the scope is increased by the addition of more genera and species. The keys are based on 160 genera and 500 species of the common native woody plants and a few commonly planted exotics of the northeastern United States. Keys are provided for the identification of genera and species in the summer and winter conditions.

Emmie Rane Randolph — A cytological study of two types of variegated pericarp in maize. Cornell Univ. Agr. Exp. Sta. Memoir 102. 1926.

This is a study for the purpose of testing the hypothesis that the non-inherited "dark crown" and the inherited "near-self" characters are due to mutations in epidermal and subepidermal tissues, respectively. In both cases pigment is found in both tissues. This is unfavorable to the hypothesis unless certain mutant characters may appear in adjacent nonmutated tissue.

B. Wann and E. F. Hopkins — Further studies on growth of *Chlorella* as affected by hydrogen-ion concentration. Bot. gaz. 83:194-201. 1927.

Further studies on hydrogen-ion concentration and iron in their relation to the growth of *Chlorella* have shown that if the experiments are arranged so as to keep the iron in solution at all the reactions studied, the organism will increase well over the alkaline side of neutrality. The alkaline limit for growth, which is about pH 8.5, may then be the result of the increasing concentration of the hydroxyl ion. A complete graphical representation of the effect of hydrogen-ion concentration on *Chlorella* is shown. The horizontal nature of this curve between pH 7.0 indicates little variation in growth in this region.

Dairy Industry

S. Guthrie — A statistical study of creamery operation. Journ. dairy sci. 10:250. 1927.

This study correlates the following nine factors of creamery operation in 78 Minnesota creameries: price paid for fat, in cents; price received for butter, in cents; score of butter; percentage of overrun; cost of labor per hour, in cents; hours of labor to make 1000 pounds of butter; pounds of butter made in 1919, in thousands; building cost per 1000 pounds of butter, in cents; equipment cost per 1000 pounds of butter, in cents. The data show that the amount of labor which goes into butter, and the volume of output, together with quality (which is measured by the score and reflected by the price of butter), are the important economic considerations in making butter.

T. Henrici — Involution forms of *Escherichia coli*. Journ. infect. diseases 39:429. 1926.

Measures of the rate of death and of autolysis, and of variation in form of bacteria, are described and discussed. The rate of autolysis may be estimated by the time intervals between the curves for death of the cells as determined by plate counts and as determined by their staining with Congo red. The degree of variation in form has been computed by the products of the frequency of the various cell types and the reciprocal of their mean frequency, the fluctuations being expressed as index numbers.

The rate of death and autolysis, and the degree of variation in form were determined in five cultures of *Escherichia coli* grown on peptone agar: 2 neutral, and alkaline in reaction, and containing sodium chloride and calcium chloride, respectively. No correlation could be established between the degree of variation in form and the rate of death or the favorableness of the medium for growth. There was found a definite rank-order correlation between the degree of variation in form of the cells and the rate of autolysis of the cells. The rate of autolysis in the various cultures was as follows: acid, 17 days; neutral, 13.25; sodium chloride, 6.25; acid, 4.25; calcium chloride, 2.5. The mean index of variation in form of the cells was as follows: acid, 67.71; neutral, 87.56; sodium chloride, 93.01; acid, 93.52; calcium chloride, 157.25.

- A. T. Henrici — Morphologic variation and the rate of growth of bacteria. *Bacteriol. Rev.* 1:17. 1927.
W. V. Price — A method of interpreting the scores of judges of dairy products. *Journ. dairy sci.* 10:41. 1927.

Competent judges rarely use the same range of scores when grading the same series of samples of dairy products. If the range of scores used by a judge is assigned a value of 100, then the poorest sample assumes a score of 0 and the best sample a score of 100. The actual scores of the intermediate samples are transposed to this common scale of 100 by the formula

$$x = \frac{100 (s-m)}{r}$$

in which x is the score on the common scale of 100 (termed in the discussion *ratio score*), s is the actual score of the sample assigned by the judge, m is the minimum score of the series examined by the judge, and r is the maximum less the minimum actual score. The ratio score indicates the relative quality of the sample to the quality of all the samples in the series examined by the judge. It is held that the ratio score can be more correctly used than the judge's actual score in determining the mean, the standard deviation, and other results, for the series.

- W. V. Price — The manufacture of Cheddar cheese from milk pasteurized by the holder method. *Cornell Univ. Agr. Exp. Sta. Memoir* 105. 1927.

A series of experiments demonstrated the advantages of making Cheddar cheese from milk pasteurized by heating to 145° F. for thirty minutes. The cheese produced, when compared with the product made from identical raw milk, was of better quality, of superior keeping properties, and more uniform. Manufacturing losses were reduced and the yield was increased. The best results seemed most apparent when the raw milk was of inferior quality. Actual trial on a commercial scale demonstrated the economy and profit of the process. A description of the method of manufacture is included.

- W. V. Price — Cheddar cheese from pasteurized milk. *Journ. dairy sci.* 10:10. 1927.

A discussion is here given of the results of experiments showing the effect of pasteurization of milk for Cheddar cheese made under commercial conditions.

- Otto Rahn — Fettgehalt und spezifisches Gewicht des Rahms. *Milchwirtschaftliche Forschungen* 3:512. 1926.

A formula was developed to calculate the density of fat from the density of cream and its fat content. In a study of a large number of samples of cream extending over a period of about two years, the density of the cream at 50° C. and the fat content were determined and the density of the butterfat was calculated. This calculation showed that there is a considerable variation in the density of the fat in milk, ranging from 0.8894 to 0.9010 at 50° C. This is a variation of 1.5 per cent. This variation of density is of practical importance in regard to the volumetric fat determinations in milk and cream, as, for example, the Babcock test. In these methods the volume of the fat is measured and given in percentage of weight, under the assumption that a given volume always corresponds to the same weight. The above data show that this is not the case. There is a possible error of 1.5 per cent of the total amount of fat found. In milk with 3.5 per cent of fat, this would mean an error of 0.052 per cent which is negligible; but in cream with 30 per cent fat the error would be 0.45 per cent.

possible error amounts to 0.45 per cent, or almost 0.5 per cent. This is the error from this one source alone, to which must be added the errors resulting from the technic of the method. If the amount of fat in butter should be determined by this method, as has been frequently proposed, the error would be more than 1 per cent. This investigation shows that the accuracy of this routine method of fat determination is limited. The Babcock method is absolutely correct if the density of fat is 0.9903 at 50° C.

Rahn — Zur Theorie der Butterbildung. *Milchwirtschaftliche Forschungen* 3:519. 1926.

The object of this paper is an analysis of the evidences for the two modern theories of churning. According to the one, butter forms in the churn through an inversion of phases. This has been recently held to be proved by the fact that the conductivity of the cream during churning is reduced. The author believes that this seeming proof does not hold because the same reduction is obtained in churning skimmilk, with which an inversion of phases is impossible because there is but one phase.

Graphic illustrations of the structure of the butter according to the two theories of churning are given. The author is in favor of the second theory, which assumes that the butter is formed in the foam of the cream through aggregation of the fat globules, so that even in the finished product there are still individual fat globules in existence. This is proved by the fact that salt can diffuse into unsalted butter, while it cannot penetrate a continuous layer of fat. The evaporation of moisture from butter cannot be used as evidence in favor of either of the theories, because moisture was found to evaporate even through solid layers of fat.

Considering all evidences brought in favor of the one or the other theory, there seems nothing in favor of the inversion of phases except the form of the droplets of moisture in butter. All other experiences speak in favor of the foam theory.

Rahn and P. F. Sharp — The physics of milk and its products. (Book.)

E. Ross — The care and handling of milk. (Book.)

F. Sharp — Wheat and flour studies, VIII. The composition of wheat and mill products from frozen and non-frozen wheat harvested at various stages of maturity. *Cereal chem.* 3:402. 1926.

The wheat and flour obtained, as described in a previous paper, was subjected to routine analysis. The ash content of flour milled from the frozen wheat was slightly higher than in the flour milled from non-frozen wheat harvested at the same stage of maturity. Protein-fraction analysis of flour milled from wheat harvested at various stages of maturity indicated no change in the glutenin, an increase in gliadin, and a decrease in the 5-per-cent-potassium-sulfate soluble-protein fractions, as the kernel develops. Flour milled from the frozen wheat contained a slightly greater percentage of 5-per-cent-potassium-sulfate soluble protein and a slightly smaller percentage of glutenin than did the flour milled from the non-frozen wheat at the immature stages of development. The experimental part of this investigation was carried out at the Montana Agricultural Experiment Station.

F. Sharp — Wheat and flour studies, IX. Density of wheat as influenced by freezing, stage of development, and moisture content. *Cereal chem.* 4:14. 1927.

The density of wheat grown under uniform conditions and harvested at various stages of maturity does not differ to any great extent, provided it is desiccated under approximately uniform conditions and is not affected by different amounts of yellow berry or by great differences in protein content. Light freezing in itself does not affect the density of wheat to any marked degree, while severe freezing, at the immature stages as carried out in the experiments reported here, causes an increase in density. The moisture content and the moisture history exert a marked effect on the density of wheat. An explanation is offered for the effect of damp weather on wheat which has once been desiccated in the field, in producing the so-called "bleached wheat." It was shown that different samples of wheat may show marked differences in the ability of the kernels to contract on the removal of moisture from wheat which has once been air-

dried and then increased in moisture content. It is suggested that three factors affect the density of wheat other than the possibility of kernel size: (1) moisture content and moisture history; (2) protein content; and (3) protein quality. The experimental part of this investigation was carried out at the U. S. Agricultural Experiment Station.

- P. F. Sharp and T. J. McInerney — The colorimetric determination of the hydrogen-ion concentration of milk, whey, and cream. *Journ. biol. chem.* 70:729. 1927.

A method for the colorimetric determination of the hydrogen-ion concentration of milk, whey, cream, powdered milk, evaporated milk, and sweetened condensed milk, using standard buffer solutions, is here described. This method is based on the application of correction factors for the effect on the hydrogen-ion concentration of diluting the product with 19 volumes of distilled water in order to reduce the turbidity and to make it possible for light to pass through the solution. The method gives results which are usually correct within ± 0.06 pH.

- J. M. Sherman — The status of milk pasteurization with special reference to the process of electrical flash pasteurization. *Dairy products merchandising* 5:1927.

This is a detailed study of the scientific basis of pasteurization by the so-called holder process, in which the milk is heated for thirty minutes at 145° F. It is a review of the extensive studies that have been made of the thermal death point of the pathogenic bacteria which are sometimes carried by milk. It is shown that the commonly used method of pasteurization by the holder process is based on sound principles. A further study of the records of milk-borne epidemics shows that these are carried almost exclusively by raw milk, and that when pasteurized milk has been involved the fault has been due to recontamination or faulty methods in most cases if not in every case. A review of the experimental data available on the electrical process of pasteurization does not make it to be fully equal to standard pasteurization, while some of the available data indicate that it is not.

- J. M. Sherman — Extend cheese life with vacuum method. *The glass container* 6⁵:18. 1927.

A new process of prolonging the life of cream, cottage, and other soft cheeses by packing in vacuum sealed containers, has been developed. With this process which prevents the growth of molds, soft cheeses have been kept in a perfectly edible condition for a period of a year when held at temperatures of about 35° F. The same products when packed in the ordinary way will keep in good condition for only two or three weeks at the same temperature. When kept at temperatures which are available in the ordinary home refrigerator (55° to 60° F.) the vacuum-packed cheese will keep for at least a month, while even at ordinary room temperatures it remains good for two weeks. The advantages of this method are particularly important for delicatessens, hotels, dining cars, and other places where cheese is wanted in small quantities and where it needs to be kept for some time.

- J. M. Sherman and C. N. Stark — The quantitative and qualitative distribution of lactobacilli in milk. *Journ. bact.* 13:60. 1927.

The approximate quantitative occurrence of lactobacilli in milk was determined by special methods developed for this purpose. Tests were made on 233 samples of milk, of which 66 were of Grade A quality (New York City classification) and 167 were ordinary milks of indifferent quality. It was found that in general, lactobacilli occur in numbers of from 10 to 1000 per cubic centimeter in ordinary milks, while the number in Grade A milk is usually lower, ranging from 1 to 100 per cubic centimeter as a rule. It has been found that *Lactobacillus casei* is generally present in milk in considerably greater numbers than *Lactobacillus bulgaricus* or *Lactobacillus acidophilus*. Of the Grade A milks examined only 12 per cent contained *bulgaricus* or *acidophilus* in numbers as great as 100 per cubic centimeter while 71 per cent contained *casei* in greater numbers. Likewise, with ordinary milks, less than 3 per cent contained *bulgaricus* or *acidophilus* in numbers exceeding 10 per cubic centimeter, while more than 10 per cent contained *casei* in numbers exceeding 10 per cubic centimeter of *casei* were found in 94 per cent of the samples.

M. Sherman, C. N. Stark, and Pauline W. Stark—The influence of diphtheria toxin on the growth of certain bacteria. *Journ. bact.* 13:45. 1927.

When diphtheria toxin was added to beef-infusion broth so that the resulting medium contained 30 m.l.d. per cubic centimeter with *Bacillus cereus*, a slight but definite retardation of growth in the presence of toxin has been repeatedly observed. While it cannot be definitely stated that the factor which is toxic to *B. cereus* is the same factor which is toxic to higher animals, certain observations support that view. Heating entirely destroys the factor which is inhibitory. The toxic factor for *B. cereus* is apparently inactivated when sufficient antitoxin is added to neutralize the diphtheria toxin.

M. Sherman, C. N. Stark, and Pauline W. Stark—Further observations on apparent effect of diphtheria toxin on growth of bacteria. *Soc. Exp. Biol. and Med. Proc.* 24:545. 1927.

In a previous report the fact has been noted that diphtheria toxin, when added to cultures of *Bacillus cereus* in a concentration of 30 m.l.d. per cubic centimeter, leads to a slight but definite retardation of growth. While our data do not prove that the inhibitory factor for *B. cereus* is in fact the toxin rather than some other by-product of growth of the diphtheria organism, there is some basis for believing that this may be the case. Of particular interest is the fact that the addition of antitoxin appears to counteract this inhibitory action. In the present paper it is recorded that similar results have been obtained with *Proteus vulgaris* and *Staphylococcus albus*. The apparent inhibitory effect of the diphtheria toxin on the growth of these organisms is of about the same magnitude as in the case of *B. cereus*.

M. Sherman, C. N. Stark, and Pauline W. Stark—The destruction of botulinum toxin by intestinal bacteria. *Soc. Exp. Biol. and Med. Proc.* 24:546. 1927.

In our studies of the destruction of toxins by bacteria a number of interesting, and perhaps important, observations have been made. Among these the destruction of the toxin of *Clostridium botulinum* by certain intestinal types of bacteria may be worthy of particular note. Several investigators have shown that if large numbers of detoxified botulinum spores are fed to experimental animals, death from botulism will ensue, indicating that, under some conditions, the organisms can grow and produce their toxin in the intestinal tract. Since it is well known that the organisms of botulism are frequently ingested with such foods as raw vegetables, fruits, and milk, the question naturally arises as to why the disease is not commonly transmitted in this way. It may also be questioned whether some of the so-called auto-intoxications are not in fact incipient botulism arising from the limited growth of these organisms in the intestinal tract, with the production of sublethal quantities of toxin. It is suggested that the probable explanation is to be found in the action of the intestinal bacteria upon the toxins which may be formed in the alimentary tract. Results were obtained which indicate the destruction of botulinum toxin by *Bacterium coli*, *Bact. communior*, *Bact. aerogenes*, and *Proteus vulgaris*. It is believed that these results may explain the fact that the ingestion of small numbers of spores of the organism of botulism leads to no apparent ill effects.

N. Stark and P. F. Sharp—The relationship between the hydrogen-ion concentration of egg white and the growth of anaerobes. *Journ. bact.* 13:59. 1927.

It has been found that the hydrogen-ion concentration of egg white changes rather rapidly from about pH 7.6 to pH 9.5 due to the loss of carbon dioxide, if the freshly laid egg is kept for a short time in a well-ventilated place. This change in pH should be sufficient to markedly affect the growth of microorganisms in the egg white. Recent investigations have shown that egg white corresponding to the pH of the white of fresh eggs (about 7.6) permitted growth of a number of aerobes, while egg white corresponding to the pH of eggs which are in carbon-dioxide equilibrium with normal air (pH about 9.5) was apparently germicidal. A somewhat similar study has been carried out with a number of anaerobes with the same result; that is, the anaerobes were found to grow in egg white with a pH corresponding to that of a fresh egg, while no growth was found in egg white with a pH corresponding to that of eggs in carbon-dioxide equilibrium with normal air. These observations should be of practical importance in regard to the storage of eggs.

- R. L. Starkey and A. T. Henrici—The occurrence of yeasts in soil. *Soil sci.* 23:33. 1927.

Yeasts were found in small numbers in thirty-nine of eighty-seven soil samples. There was no correlation between the occurrence of yeasts and the type of soil, the nature of the crop, or the season of the year. The yeasts were found in such small numbers and so haphazard in distribution as to indicate that they play no important part in soil transformations. Forty-nine strains which were isolated fell naturally into twelve groups or species. Of these but three, *Nadsonia fulvescens*, *Willia anomala*, and *Torula glutinis*, could be positively identified. The remaining strains were species of *Zygosaccharomyces*, *Torula laspora*, *Saccharomyces* (two species), *Pichia*, and *Torula* (four species).

- C. K. Tucker—Estimation of quantities of cream and milk in vats. *N. Y. prod. rev. and Amer. cream.* 62:666. 1926.

When measuring milk for cheese making, the estimates on the large vat made by one cheese maker during the period of twenty-two days averaged 0.356 per cent less than the actual, while another cheese maker's estimates averaged 0.19 per cent less than the actual. For the same period of time the estimated yield of cheese per 100 pounds of milk were compared with the actual yields per 100 pounds, and the results showed that the estimated yields were well within 2 per cent of the actual yields. A steel measuring rod, calibrated in inches, was employed in estimating the weight of cream in a 500-gallon vat pasteurized. Usually the vat was nearly full. The range of three estimators on ninety-one readings was from 51.75 pounds of cream above the actual, to 57.73 pounds below the actual, or a total spread of 109.48 pounds as the greatest variation.

- W. O. Whitcomb and P. F. Sharp—Wheat and flour studies, VII. Milling and baking tests of frozen and non-frozen wheat harvested at various stages of maturity. *Cereal chem.* 3:301. 1926.

Heads from Marquis wheat were gathered at intervals of from two to four days during development. Half of each day's harvest was air-dried at once and the other half was thoroughly frozen before being air-dried. The wheat when dry, was threshed, milled, and baked. The baking results indicated that the loaf volume was not affected by the freezing alone if an aliquot of the same wheat, non-frozen, at the same stage of maturity, was used as a standard for comparison—provided the wheat kernels contained less than about 46 per cent moisture at the time of freezing. An increase in loaf volume, when harvested under these conditions, occurred as the wheat matured. The experimental part of this investigation was carried out at the Montana Agricultural Experiment Station.

- L. L. Van Slyke and W. V. Price—Cheesemaking. (Book.)

Entomology and Limnology

- G. C. Embury—Stocking policy of the Genesee River system. *In* A biological survey of the Genesee River system. New York State Conservation Department Supplemental to sixteenth annual report, 1926, p. 12-28 and Appendices IX-XI with Maps 1 to 5.

Field work in cooperation with the New York State Conservation Commission is here reported. The factors on which a stocking policy is based, and the development of such a policy for the Genesee watershed, are discussed.

- G. C. Embury—An outline of stream study and the development of a stocking policy. Contributions from the Aquicultural Laboratory, Cornell Univ. 1927.

A discussion is presented of the factors involved in the study of a stream for the purpose of developing a stocking policy, with directions for field work.

- G. C. Embury and Charles O. Hayford—The advantage of rearing brook-trout fingerlings from selected breeders. *Amer. Fisheries Soc. Trans.* 55:135. 1927.

Experiments carried on in cooperation with the New Jersey State Fish Hatchery tend to show that resistance to hatchery diseases and the rate of growth of young trout may be increased to a marked degree through proper selection of breeders. In the course of three generations of selective breeding the rate of growth was doubled while the average mortality from the sac fry to the 4-inch fingerling stage was gradually reduced from 98 per cent to 5 per cent.

ace H. Griswold — Notes on some feeding habits of two chalcid parasites. Ent. Soc. Amer. Ann. 19:331-334. 1926.

This article describes some peculiar feeding habits of two parasites of the geranium aphid, *Macrosiphum cornelli* Patch.

ace H. Griswold — Observations on the biology of a new geranium aphid (*Macrosiphum cornelli* Patch). Journ. econ. ent. 20:91-94. 1927.

The host plant of the aphid, the number of instars, the length of the reproductive period, and the number of young produced, are discussed. Notes are given on four parasites reared from the aphid. Control measures are suggested.

enn W. Herrick and T. Tanka. The spruce gall-aphid. Cornell Univ. Agr. Exp.

In this article an attempt is made to show, in a graphic way, the great capabilities of aphids to multiply and become destructive, and therefore the importance of fighting them early in their development. The lesson is especially timely in view of the enormous numbers of aphids this year and the success in controlling them of those growers who sprayed in the delayed dormant period.

enn W. Herrick and T. Tanaka. The spruce gall-aphid. Cornell Univ. Agr. Exp. Sta. Bul. 454. 1926.

This bulletin presents the result of several years study of a serious pest of the Norway spruce. An economical and effectual method of control, which can be applied by anyone with success, is prescribed.

A. Johannsen — Notes on the synonymy of some New York State Chironomidae. New York Ent. Soc. Journ. 34:273-278. 1926.

Specimens from the United States were compared by the author with the types in various European museums.

A. Johannsen — *Diamesa* (*Psilodiamesa*) *lurida* Garrett. Brooklyn Ent. Soc. Bul. 21:205. 1926.

A description of the male of this species from the Yellowstone Park.

A. Johannsen — *Wohlfahrtia vigil* Walker, a parasite upon rabbits. Journ. parasitol. 13:156. 1926.

This species, an accidental parasite on man, is discovered to be parasitic on wild rabbits also.

A. Johannsen — The Genus *Stenoxenus*. Ent. news 38:70-72. 1927.

Keys to all known species of *Stenoxenus* are here given, with a description of one new to science.

F. Phillips — The new beekeeping. Address of the retiring president of the Apis Club. Bee world 8:35. 1926.

A discussion is presented of the differences in beekeeping practices at present and in former periods, based on biological findings.

F. Phillips — La disinfezione dei favi appestati. Apicoltura Ital. 22:235. 1926.

This article discusses the progress which has been made in disinfecting combs containing larvæ that are dead of American foulbrood, with explanations of the necessity for certain practices.

F. Phillips — Beekeepers' organizations in Europe. Iowa State Apiarist. Ann. rept. 1926:27. 1926.

Beekeepers' organizations in Europe are compared with similar societies in America, and a study is made of the reasons for the differences, based on differences in character of the honeys produced, in intensity of the honey flows, and in economic conditions.

F. Phillips — Standardization of beekeeping equipment. Bee world 8:138. 1926.

This is a discussion of the benefits and the disadvantages of standardization of hives and other beekeeping supplies, based on the history of such standardizations in various countries.

F. Phillips — Distribution of the bee louse. Gleanings in bee culture 55:86. 1926.

Distribution in the United States only is discussed here.

F. Phillips — Die Desinfektion bössartiger Faulbrut-waben in Amerika. Arch. Bienenkunde 8:42. 1926.

An explanation is offered for the extensive use of disinfecting solutions for combs from colonies of bees containing American foulbrood, with a discussion of the benefits that have been derived from this use.

- E. F. Phillips — Winter losses in the United States. Bee craft 9:19. 1927.

This is a statistical study of these losses, with a discussion of the reasons for the variation found.

- E. F. Phillips — Bees and red light. Amer. bee journ. 67:198. 1926.

A discussion is presented of the behavior of honeybees when exposed to red light alone.

- J. G. Needham — The Rocky Mountain species of the mayfly genus *Ephemerella*. Ent. Soc. Amer. Ann. 20:107-117. 1927.

This paper deals with mayflies of the genus *Ephemerella* collected in northern Utah during the summer of 1926. The following new species are described: *E. doddsii*, nymph and adult; *E. margarita*, nymph only; *E. spinifera*, nymph only. The old species included are: *E. grandis*, nymph and adult; *E. coloradensis*, nymph only; *E. inermis*, nymph only; *E. hecuba*, nymph only.

- J. G. Needham — A baetina mayfly nymph with tusked mandibles. Canad. ent. 59:44-49. 1927.

In this paper the writer describes the nymph and the adult of a new species of mayfly, *Leptophlebia packii*, reared from the Ogden River, Utah, during the summer of 1926. The nymph is very unusual in that its mandibles are tusked, a characteristic supposed to belong only to the nymphs of the subfamily Ephemerinae.

- J. G. Needham and Elsie Broughton — Central American stoneflies, with descriptions of new species. New York Ent. Soc. Journ. 35:109-121. 1927.

This paper is a recharacterization of the old species of stoneflies from Central America and Mexico, with descriptions of a few new ones. The old species characterized are *Anacroneuria annulicauda*, *A. nigrocincta*, *A. cincta*, *A. aethiops*, *A. dilaticollis*. New species described are *Anacroneuria sulana*, *A. naomi*, and *A. coronata*. The egg and the nymph of this genus of stoneflies also are described.

- J. G. Needham and Reed O. Christensen — Economic insects in some streams of northern Utah. Utah Agr. Exp. Sta. Bul. 201. 1927.

This reports a preliminary examination of some Utah trout streams, made for the purpose of discovering what forms of life are present in the streams and in what relative abundance. Emphasis is laid on the insect larvae inhabiting trout streams which serve as food for trout. Insect orders considered are Ephemerida, Plecoptera, Odonata, Trichoptera, and Diptera. A few notes on the plant life in such streams are included. The economic value of such work on streams lies in its relation to the increase of trout production.

- J. G. Needham and P. R. Needham — Guide to the study of fresh-water biology. Amer. Viewpoint Soc. 1927.

This paper contains condensed keys, tables, and plates to help the beginning student of fresh-water biology to identify quickly the commoner forms of life found in fresh water. Salt-water, alkaline-water, and cave-dwelling forms are omitted, as are also vertebrate animals and vascular plants. Part I lays the emphasis on aquatic insects, and includes sections on crustaceans, molluscs, plankton, and a few of the common lesser invertebrates. Part II contains suggestions for class work in fresh-water biology, with outlines of the introductory course in limnology as it has been given in Cornell University.

Floriculture and Ornamental Horticulture

- A. W. W. Sand — A study of *Pogoniris* varieties. Cornell Univ. Agr. Exp. Sta. Memoir 100. 1926.

The botany of the iris is dealt with in detail, and keys to the species are included. There is a description of varieties in alphabetical order, from A to F inclusive.

Plant Breeding

- R. G. Wiggans — Method now employed in testing F_1 corn hybrids at the Cornell University Agricultural Experiment Station. Amer. Soc. Agron. Journ. 18:794-798. 1926.

The great increase in corn-breeding work due to the development of the inbreeding method has presented to investigators the problem of adequately

testing the large number of F_1 hybrids resulting from the crosses of many inbred strains. The method of testing here outlined provides for a fairly economic use of land for such tests. Inbred strains are in competition only with inbred strains; commercial varieties with commercial varieties; and F_1 's with F_1 's. Close comparisons can be made between (1) the F_1 and the commercial varieties from which the inbred strains were derived, (2) the F_1 and the inbred strains, and (3) the commercial varieties and the inbred strains derived from them. The method used also permits of determining readily by statistical methods whether the F_1 's are better than the parent varieties.

G. Wiggans — Pasture studies. Cornell Univ. Agr. Exp. Sta. Memoir 104. 1926.

This memoir presents the results of a five-years study of the effect of fertilizers, lime, manure, seeding, and cultural treatments on the production and the botanical composition of three pasture areas in different stages of productivity. Total vegetation was increased by the use of acid phosphate, and this increase was due almost wholly to a change in vegetation resulting in a larger proportion of grass and clover and a decrease in the proportion of weeds. Although nitrate of soda increased total vegetation by an increase of grass and weeds at the expense of the clover, nitrogen might better be added to pastures through a stimulation of legume production than by using a nitrogenous fertilizer. The results would indicate that potash is of doubtful value for use as a pasture fertilizer. The effect of lime was not only to increase the total vegetation, but also to change the vegetative composition by decreasing the proportion of weeds. The author recommends the use of lime to increase the production and the quality of New York pastures. The results on one area demonstrated that a considerable increase could be expected from applications of manure. Plowing caused a marked change in vegetative composition at first, by decreasing weeds, but this effect had largely disappeared by the end of five years. The results obtained on all three areas lead the author to state that reseeding as a means of renovating old pastures cannot be recommended.

G. Wiggans — Sunflowers as compared with corn as a silage crop for New York. Cornell Univ. Agr. Exp. Sta. Bul. 456. 1926.

The silage-crop investigations here reported include (1) a comparison of corn with sunflowers, (2) a comparison of corn and sunflowers with various mixtures of the two, (3) a study of the optimum rate of planting sunflowers when grown alone, and (4) breeding of sunflowers for silage purposes. Sunflowers alone averaged 52 per cent more green weight and 33 per cent more dry weight than did corn alone. The dry-matter percentage in the corn varieties used was higher than that in the sunflowers. Various mixtures of corn and sunflowers resulted in yields of sunflowers out of all proportion to the proportion of sunflower plants in the mixture; for instance, 25 per cent of sunflower plants resulted in from 50 to 75 per cent, by weight, of sunflowers at harvest. An increase in the percentage of sunflowers in the mixture was accompanied by a marked decrease in the percentage of grain in the corn of the mixture. Mixtures of corn and sunflowers generally yielded more than did an equal area sown one-half to corn and one-half to sunflowers. The optimum rate of planting sunflowers alone was found to be not less than 6 inches nor more than 9 inches apart in rows 36 inches apart. By inbreeding and subsequent selection, strikingly distinct types of sunflower plants have been developed and considerable progress has been made in fixing a type which may overcome the chief objection to the crop—that is, the mechanical difficulties in handling.

Plant Pathology

Ivan Cecil Boyd — The relative efficiency of some copper dusts and sprays in the control of potato diseases and insect pests. Cornell Univ. Agr. Exp. Sta. Bul. 451. 1926.

Field tests of the relative efficiency of copper dusts and sprays and of dusting machines, were accompanied by laboratory studies of the materials and spore-germination tests with *Phytophthora infestans*. When equal amounts of copper were applied to damp foliage, in the copper-lime dust with a good hand machine or the best of the power dusters, and in the bordeaux mixture with exceptionally good sprayers, the control of early and late blights and of aphids was

about equal in the two methods. The spray coating seemed to be superior in the control of flea beetles, leaf hoppers, and tipburn. The copper-lime dust was less effective when applied to dry foliage. The average gain in yield of sprayed over dusted plots, for three years, was 7.2 bushels per acre. Heavy coatings of either dust or spray caused stunting, and injury to the vines resulted from driving sprayers or dusters through the plots. Spraying costs less than dusting.

Walter H. Burkholder and Albert S. Muller — Hereditary abnormalities resembling certain infectious diseases in beans. *Phytopathology* 16:731-737. 1926.

Descriptions are given of two abnormalities of the bean plant, *Phaseolus vulgaris*: one a leaf character resembling a mosaic, and the other a seedling wilt. Failure to find a causal organism or an infectious principle led to a genetical study of the two characters. Data concerning their mode of inheritance indicate that both are recessive characters and that two factors are involved in each case.

Walter H. Burkholder — A new bacterial disease of the bean. *Phytopathology* 16:915. 1926.

A severe blight and wilt of the bean in New York has been discovered to be due to a hitherto undescribed bacterium which has been given the name *Phytomonas medicaginis* var. *phaseolicola*. The symptoms of the disease are not strikingly different from those of the disease due to *Phyt. phaseoli* and *Phyt. flaccumfaciens*. The organism has been isolated from diseased specimens and its pathogenicity has been proved. A description of the morphology of the pathogene, together with its cultural characters, has been given. In addition to the common bean (*Phaseolus vulgaris*), the scarlet runner bean (*P. multiflorus*) and the lima bean (*P. lunatus*) have proved susceptible. This is a part of a general study on the etiology of bean blight. It is hoped that when the study is completed the foundation will be laid for the development of control measures.

G. H. Coons and Dewey Stewart — Prevention of sugar beet seedling diseases. *Phytopathology* 17:259-296. 1927.

H. M. Fitzpatrick — Mushrooms on trees. *Tree talk* 8:4-6. 1926.

Anna E. Jenkins. Brown canker of the rose. *Amer. rose annual* 1927:161-183. 1927.

One of the most important diseases of roses is described in this detailed summary of the available information on brown canker, based primarily on the author's observations on the disease since 1918. The symptoms of the disease on stems, leaves, and blossoms are discussed, and illustrations of these in a colored plate and eight half-tone plates are given. About one-third of the paper is devoted to control. Successful spraying experiments with bordeaux mixture are recorded. The history of the causal fungus, *Diaporthe umbrina*, is set forth together with observations on the life history of the pathogene. A list of over 175 varieties on which brown canker has been observed concludes the article. In addition, the paper contains a colored illustration of branch canker, caused by *Coniothyrium wernsdorffiae*, and a brief description of its symptoms prepared by Miss Cynthia Westcott.

L. M. Massey — Fusarium rot of gladiolus corms. *Phytopathology* 16:509-523. 1926.

This disease, one of three important fungous diseases of gladiolus corms, is reported for the first time. The causal pathogene, *Fusarium oxysporum gladioli* n. var., is described in detail and symptoms of the disease are recorded.

L. M. Massey — Fruit diseases of the past season. *New York State Hort. Soc. Proc.* 72:14-24. 1927.

L. M. Massey — Control of gladiolus diseases. *Amer. Gladiolus Soc. Official bul* 4:20-22. 1927.

L. M. Massey — Harold Wakefield Fitch. *Phytopathology* 17:205-206. 1927.

A. G. Newhall — The importance of controlling celery blight in the seedbed. *Phytopathology* 16:467-472. 1926.

Both late blight (*Septoria apii*) and bacterial blight, or leaf spot (*Pseudomonas apii*), of celery were found in considerable abundance on small plants

in out-of-door seedbeds. When from two to four applications of 20-80 copper-lime dust were made while the plants were in the seedling stage, a marked reduction in subsequent blight development throughout the season was obtained in six out of ten fields. The control of blights was reflected in substantial increases in yields at the end of the season.

- J. A. B. Nolla — A new *Alternaria* disease of onions (*Allium cepa* L.). *Phytopathology* 17:115-132. 1927.

A new disease of onions caused by *Alternaria allii* n. sp. is described from Porto Rico. The symptomatology and the etiology of the disease are described, and those characters which distinguish this from other *Alternaria* diseases of onions already reported are pointed out. The epiphytology of the disease is discussed on the basis of field studies and observations.

- Cynthia Westcott — An epiphytotic of brand cankered rose, caused by *Coniothyrium wernsdorffiae* Laubert. *Plant disease reporter* 10:38-40. 1926.

- H. H. Whetzel — North American species of *Sclerotinia* — I. *Mycologia* 18:224-235. 1926.

This is the first of a proposed series of papers dealing with the occurrence, description, and life history of species of *Sclerotinia* from North America. Two species found on *Erythronium* are treated in this paper: *S. gracilis*, described by Clements from Nebraska on *E. albidum*; and a new species, *S. erythronii*, collected about Ithaca, New York, and parasitic on *E. americanum*.

- H. H. Whetzel — Hemibasidiomycetes. Ustilaginales and Uredinales. *In* Scientific survey of Porto Rico and the Virgin Islands. *New York Acad. Sci.* 8¹:107-144. 1926.

This paper constitutes one section of the number of this survey devoted to the fungous flora of these islands. The first complete record of the known species of rusts and smuts heretofore reported from Porto Rico and the Virgin Islands is made. Brief field and technical notes on the several species are given, together with their known distribution in other parts of the world.

- H. H. Whetzel, F. J. Seaver, and Cynthia Westcott — Studies on Bermuda fungi. I — *Poronia leporina*. *Mycologia* 19:43-50. 1927.

This paper records the occurrence of this rare pyrenomycetous fungus in Bermuda, where it was collected on rabbit dung. Studies on the life history of the fungus in pure culture are reported and illustrated.

- H. H. Whetzel and I. E. Melhus — Joseph Rosenbaum. *Phytopathology* 16:895-897. 1926.

- H. H. Whetzel — Dusting fruit trees. *Ohio State Hort. Soc. Proc.* 60:76-89. 1927.

- Richard P. White — Studies on tomato wilt caused by *Fusarium lycopersici* Sacc. *Journ. agr. res.* 34:197-239. 1926.

The temperature relations, growth rates, and hydrogen-ion relations, of twenty-four strains of *Fusaria* isolated from wilted tomato plants from various parts of the United States were studied. Five strains were found to be more virulent than the remaining nineteen. Cultural differences between strains in the two groups were evident only on certain media. *Fusarium lycopersici* grown on a modified Richard's solution produces substances highly toxic to cut tomato plants, causing wilting and death in a short time. These two substances were separated by physiochemical means into two classes: the first colloidal, thermolabile, and of the nature of an enzyme; the second crystalloidal, dialyzable, thermostable, volatile and non-volatile. These toxic substances produced by *F. lycopersici* also caused wilting of cowpea, soybean, and cabbage. The toxic substances produced by *F. Oryzporum* caused wilting of tomato plants.

Pomology

- D. B. Carrick — The respiration of apples at low non-freezing temperatures and while frozen. *Amer. Soc. Hort. Sci. Proc.* 1926:277-285. 1927.

Some determinations on the respiratory rates of Yellow Newtown apple at 3°, 0°, -15°, -2°, and -3° C. are given. Ice was formed only in the fruits measured at -2° and -3° C., but at these temperatures the amount of carbon dioxide excreted per milligram hour was 1.54 and 1.76 milligrams, respectively. The corresponding values at -1.5°, 0°, and 3° C. were found to be 1.835, 2.34, and

3.35, respectively. Another set of respiratory measurements was made on McIntosh apple fruits rigidly frozen at -6° to -20° C. Even at an air temperature between -12° and -20° C., the apples evolved 0.042 milligram of carbon dioxide per kilogram hour. This rate of respiration, however, is about ninety times slower than that of similar McIntosh fruits held at 0° C. Some practical relations of respiration to apple storage are discussed in the paper.

- W. H. Chandler and A. J. Heinicke — The effect of fruiting on the growth of Oldenburg apple trees. *Amer. Soc. Hort. Sci. Proc.* 1926:34-46. 1927.

The results are based on a study of fifty-two Oldenburg apple trees which were dug and weighed after nine years growth during which half the number of trees were kept from fruiting by the removal of flowers. Pruning treatments were given to some of the trees that were permitted to fruit and to some that were deflorated. Fruiting seemed to reduce the rate of growth, but the residue of dry matter, including that in the fruit from a given leaf area, was considerably greater with the fruiting than with the deflorated plants. This greater residue, it is thought, may possibly be explained in part by a more rapid photosynthesis in a given leaf area.

- A. J. Heinicke — The set of fruit as influenced by pruning at different periods preceding the bloom. *Amer. Soc. Hort. Sci. Proc.* 1926:46-48. 1927.

Experiments with apple and pear trees indicate that the effect of pruning, so far as the set of fruit is concerned, depends among other factors on the time when the cutting is done. No benefits were observed when the pruning was done at the time when the trees were in bloom. An increased set usually follows dormant pruning provided the trees bloom, but in some cases the benefits did not become manifest until the following year. As compared with check trees, heavily pruned trees showed an improved set during three years following the treatment.

- A. J. Heinicke — The influence of fruiting on the catalase activity of the bark of apple trees. *Amer. Soc. Hort. Sci. Proc.* 1926:263-269. 1927.

In this study of the physiology of fruit production, the activity of the enzyme catalase is used as an indicator of the internal condition of the tissue of the trees. For a biennial period, monthly determinations were made of catalase in the bark of a number of individual trees which bore fruit one season and none the next. The results, presented graphically, show that the activity of the enzyme catalase is reduced by the metabolic condition accompanying or resulting from the production of fruit. Such influences of fruiting, however, are in turn subject to further modification by other factors — as, for example, pruning or the application of nitrates — so that under certain conditions it is possible to have the same catalase activity in a fruiting as in a non-fruiting tree. This contribution emphasizes the importance of studying the extent of variation that may occur in the biochemistry of individual trees which behave essentially alike as regards fruiting and non-fruiting, rather than studying only the average or composite behavior. Since the results vary with the season and the condition of the trees, the studies must be carried on for one or more biennial cycles if the true extent of the influence of fruiting is to be estimated.

- A. J. Heinicke — Some factors to be considered in the practical application of sterility studies of fruits. *New York State Hort. Soc. Memoir.* 1927.

Specific cases are cited which indicate that even though pollination is an essential process in the set of fruit, such factors as improper pruning, too close planting, lack of vigor, winter injury, unfavorable soil conditions, and the amount of fruit produced in the preceding season, may be blamable for the loss of flowers. These results suggest that more emphasis should be placed upon the study of those factors which influence nutrition, since the process of cross-pollination is frequently interfered with by unfavorable weather or other conditions beyond the grower's control.

- L. H. MacDaniels — An evaluation of certain methods used in the study of the pollination requirements of orchard fruits. *New York State Hort. Soc. Memoir.* 1927.

This critical discussion indicates that practically all methods used in pollination studies of fruits introduce factors the effects of which are difficult to evaluate. A list is given of pertinent questions concerning material, methods, and results which the author believes must be considered in the proper interpretation of pollination data.

Joseph Oskamp—Field observations in pollination. Amer. Soc. Hort. Sci. Proc. 1926:48-51. 1927.

The failure of foreign pollen to improve the unsatisfactory set in several large nonproductive orchards in western New York clearly indicates that many cases of apparent self-sterility or inter-sterility may be due to other factors which influence the nutrition and the water supply of the flowers and fruit. The importance of cross-pollination was tested, and in several cases demonstrated, by bringing into the orchard flowering branches of other varieties and providing hives of bees.

Joseph Oskamp—Soil moisture and tree growth relationships. Amer. Soc. Hort. Sci. Proc. 1926:269-277. 1927.

Excluding the rainfall during the growing season of 1926 from the surface of the soil and to a depth of 3 feet in which a seven-years-old Jonathan tree was growing, had no noticeable effect on the behavior of the tree. Soil-moisture determinations showed that more water was removed by the tree roots from the second foot below the surface—the area in which the roots were most numerous. During a dry period of two months the moisture content of the cube of soil in which the tree was growing was reduced by only 3 per cent, which amounted to a loss of about 0.5 cubic centimeter of water per day per square inch of leaf surface. Moisture content of a similar cube of soil in which no tree was growing averaged $2\frac{1}{2}$ per cent greater. Water apparently moves up by capillary action from below the 3-foot level, especially after a heavy rain. The study indicates that the conservation of soil moisture may be less important for apple-tree growth in the East than in some parts of the Middle West where the rainfall is not so evenly distributed and where evaporation is greater.

Rural Education

J. E. Butterworth—The parent-teacher association in the United States: a critical study of its activities, objectives, and organization.

This is an evaluation of the work of the organization based upon an analysis of the programs and other activities of 797 associations in nine States. These programs and activities are studied in the light of the present prevailing conception of education, and as a result it is recommended that there be considerable shift in the emphasis given to their nature. The field of the parent-teacher association is delimited, and six large objectives for such an organization are set up from the data obtained. A method for making a study of the educational needs of a community is described and illustrated as a means of aiding associations in laying out more significant programs of work. Using the data available, a scale is presented whereby a local association may take stock of itself from time to time.

J. E. Butterworth—A school building program for Utah. *In* A survey of education in Utah. U. S. Bur. Ed. Bul. 18:379-397. 1926.

Detailed data regarding school buildings were obtained in three counties. A study of these data suggest: (1) where improvements in building construction would be desirable; (2) the practicability of further consolidation of schools in certain areas; (3) that in some places there has been overbuilding; (4) that the State Department of Education should provide a competent person to advise local school officers in setting up building programs, in order that waste may be reduced and better facilities provided.

C. B. Moore—A study of problems confronting New York State rural teachers during the first week of the school year 1926-27. Reported before all regional conferences of district superintendents. An abstract published in a bulletin of the State Department of Education.

C. B. Moore—Bibliography of certain aspects of rural education. (In cooperation with J. E. Butterworth and Katherine M. Cook.) U. S. Bur. Ed. Bul. 4. 1927.

Vegetable Gardening

L. G. Gonzales—Some freezing studies on celery. Amer. Soc. Hort. Sci. Proc. 1926:339-351. 1927.

This is one of a series of studies on premature seeding in celery, and was undertaken to determine the relation of the freezing point of various parts of the

plant, to flowering. Thermocouples and Beckman thermometers were used, and generally the former gave a lower freezing-point depression than did the latter. Considerable difference in freezing point was found in different parts of the same plant, due, perhaps, to localization of materials. Seedlings exposed to relatively low temperature, which later went to seed, had a higher osmotic pressure than did those which were kept at a higher temperature during the seedling stage and which did not go to seed later. This is in line with Thompson's (unpublished) chemical data, which show higher concentrations of sugars in plants subjected to relatively low temperature during the seedling stage than in similar plants kept at relatively high temperature during the same stage.

E. V. Hardenburg — Some factors affecting tuber shape in potatoes. *Potato Assn. Amer. Proc.* 13:42-45. 1926.

Reference is made to experimental studies of record which show the relation of disease, productivity, soil type, climate, and other factors, to shape in potatoes. Various methods of expressing shape are cited, most common among which are ratio of width to length and ratio of length to thickness. Standard dimensions of length, breadth, and thickness in inches for the principal potato types were adopted by the Potato Association of America in 1916. The author has computed from these the standard coefficients of length L/W and of thickness T/L for the Cobbler, Green Mountain, and Rural types. These coefficients are used for comparison with those obtained from a three-years experiment in which the above-named varieties were grown each year on adjacent but distinct soil types. The influence of soil type on tuber shape was obtained by comparing the coefficients resulting from the measurement of more than 5000 tubers grown on peat, muck, sandy loam, and heavy silt loam soils. An average of about 400 tubers chosen at random from the crop from each soil type were measured to obtain the coefficients. The results indicate that the better aerated and more friable soils produce tubers more closely approaching the ideal shape than do the heavier soils. The tendency of the lighter soils to produce elongate-flattened tubers was especially pronounced in the Green Mountain variety. This effect was less marked in the Cobbler and the Rural types.

THE STATE EXTENSION SERVICE

An efficient extension service in agriculture must always have its yearly program of work closely correlated with economic conditions on farms. During the year 1926-27, New York agriculture began to emerge slowly from the post-war depression. This was particularly true on the dairy farms of the State. The fruit farmers, on the contrary, suffered one of the most disastrous years in their history. Vegetable growers and poultrymen enjoyed a fair measure of prosperity.

All of these conditions affect the extension-service program. Although the general teachings of the extension service continue much the same from year to year, several important timely projects to meet present emergencies were developed and pressed with great vigor. An attempt was made to study and analyze the fruit situation in the State, through two special meetings with representative fruit growers, college specialists, experiment-station workers, and representatives from the State Department of Agriculture and Markets. Following these a large number of community meetings were held to carry the recommendations for improving the situation to individual growers.

The extension service participated in a movement to increase the milk supply in New York State in order to meet the needs of New York City for the possible period of shortage in the fall of 1927. This was correlated closely with the long-time program of education in milk-marketing problems conducted by the extension service.

Every extension project is submitted to constant scrutiny to see that it is adapted to present conditions on New York farms, is economically sound, and is presented in an effective way. Extension keeps in constant contact with research in order that all teachings may be accurate and up-to-date. The acceptance of extension teaching by farmers is so immediate and the adoption of new practices so quick that the extension service and a considerable group of the best farms keep constantly abreast of new discoveries in research fields. It is of particular importance to extension that research work be given full support in the State of New York.

Administration

Extension service in agriculture, usually thought of as a recent development in the field of education, was, as a matter of fact, carried on for many years in New York before the State assumed the responsibility for a state-supported institution to carry on the formal teaching of agriculture. The present extension system, with its local county agents in every agricultural county in the State, with more than ten thousand farm men and women assuming responsibilities and acting as local leaders, with a corps of highly trained specialists working out from the College helping the county agents and leaders to formulate and carry out definite programs for the improvement of agriculture and of farm and home life, represents the progressiveness of the American farmer of today.

To be able to meet the ever-changing demands of rural life and compete with the outside forces of civilization, the successful farmer has had to reach out for every aid which science could give him in solving his many and varied farm problems. The extension service has been the means of preparing and delivering to practice the simplified results of science.

The State of New York very early saw the need of helping the farmer as a matter of public policy, and the early farmers' institutes were well supported. These institutes were organized and conducted by the State Department of Agriculture, but assistance in the form of speakers and information was sought from the experiment station and the college teachers at Cornell. For under the provisions of the Federal Land Grant, Cornell maintained a college Department of Agriculture.

In 1893 the grape farmers of Chautauqua County asked for help from the experiment station at Cornell. No funds were available, and in the following year, through their insistent appeal, an appropriation was made by the State Legislature for extension work in horticulture in the Fifth Judicial District of the State, an area comprising sixteen counties of western New York. In the next few years the scope of this work was broadened, and it finally extended to all parts of the State and for all lines of agriculture.

At first most of the extension work was carried by the regular teaching staff of the College, but the demand from the field soon required persons who could give full time to extension work. In 1909 the head of the Department of Extension at Cornell became conductor of farmers' institutes, having a district of the State under his immediate charge. This brought the institutes closer to the college extension work, and undoubtedly

paved the way for transferring the responsibility for the institutes from the State Department of Agriculture to the College in 1918.

Early in the extension work the importance of having local key men to help correlate, advise, and, in some cases, help direct local meetings was keenly appreciated, and in several counties such persons were recognized, these usually serving without salary but ready to give time and effort, and often at considerable expense, to further a worthy undertaking. The county-agent movement, which started in Broome County, New York, in 1911 with John Barron, now extension specialist in agronomy, as the first county agent, met this particular need of a local county agent to plan a more definite program, and, working with the specialists from the College, to carry more extension aid direct to the farmers; for in the early county-agent work, as well as in the early extension work of the College, it was personal contacts that were stressed. Later, as demands grew, more group meetings had to be considered and other methods devised for meeting the larger number of persons seeking aid. The further development of the county-agent work, stimulated by the passage of the Smith-Lever Act in 1914 and by additional federal funds in 1918, has been a tremendous factor in building up strong, long-time programs based on the needs of the county or the community as expressed very largely by the people themselves; and in many cases these same local leaders have been instrumental in helping to carry out the programs so formed. Helping people to help themselves, sometimes called the "self-helping plan," has always been a fundamental principle to all extension work.

The Extension Office. In 1907 the Extension Office was organized for the purpose of correlating the growing extension activities of the College, many of which concerned more than one subject-matter department. Projects such as the reading courses, Farmers' Week, and extension schools, were among the early projects developed by this office. Gradually other extension-teaching means were developed and interest among the resident teaching staff in extra-mural activities was stimulated. This office established outside contact points with granges, farmers' clubs, schools, churches, and other groups of rural persons (for example, the Experimenters' League) who desired scientific information on subjects pertaining to country life, working through these groups until the county agents made their appearance.

With the establishment and growth of the county-agent system in the field, calling for a concurrent development of subject-matter extension specialists at the College, the duties of the central correlating agency were increased. In 1919 the several administrative offices having to do with extension teaching were brought together under one head but with specific responsibility delegated to suboffices or projects as follows: Project 1, general administration, budgeting of funds, and general supervision; Project 2, central clearing house and general activities; Project 3, publications; Project 4, farm bureaus; Project 5, home bureaus; Project 6, junior extension.

The office represented by Project 2 is the clearing house, or contact point between the subject-matter extension specialists and the field, and the correlating agency for such general activities as Farmers' Week, field days, State Fair exhibits, and the like. County agents in all three branches

of the extension service, granges, schools, churches, clubs and fraternal orders, chambers of commerce and business men's organizations, and other groups, apply to this office for the services of extension specialists, who are assigned to their field engagements through the central office. Extension schools, farmers' institutes, general conferences, and other teaching means involving several departments, are organized by this office in consultation with the subject-matter project leaders. Lectures, demonstrations, and other meetings are planned and scheduled here, reports are received and tabulated, and general service is rendered to extension specialists.

Extension schools. The extension schools had their beginning in 1894, but in 1900 they were dropped for several years mainly because of lack of funds. They were resumed in 1910-11 and increased rapidly both in number and in popularity, 61 schools, mostly of five days each, being held in 1914. Not so many were held during the war years, but in the winter of 1921-22 there were 67. While expensive, the extension school represents the most intensive and far-reaching effort in extension. From the earliest trials of this means, the aim has been to teach fundamentals, stimulate observation, and encourage habits of straight thinking. A schoolroom setting is provided as far as possible, and active responses are called for. A weakness of this method lies in its comparatively heavy cost.

Some of the early extension schools were of three weeks duration. The recent trend has been toward smaller teaching units which can be rather thoroughly presented in one day. These have now largely replaced the longer schools. One-day shop schools for men and one-day sewing-machine schools for women (described elsewhere in this report) are excellent illustrations of the modern "extension school." Another variation adopted by one department is to break up a three-days program into one-day units with from three to five weeks intervening between each lesson. However, for purposes of definition in compliance with the terminology of the United States Department of Agriculture, these one-day teaching units are not reported as schools.

Lectures and demonstrations. The importance of "instruction and information" and "disseminating horticultural knowledge by means of lectures or otherwise" was recognized under the Nixon Act. During 1895 and 1896 about fifty meetings were held, with attendance ranging from 15 or 20 to 2000.

The first definite figures on the number of persons reached through extension lecturers sent out from the College were given in 1911. They were perhaps not wholly complete, but they included 194 lectures given in 44 counties to 21,560 persons. In 1914 the number of these lectures had increased to 469 given to 48,420 persons. During the fiscal year 1921-22 there were 1658 lectures given, with an attendance of 107,550. This figure was doubled in 1924, suggesting that the lecture has a very important place in the extension program.

Exclusive of time used in travel, extension specialists on the average devote about 45 per cent of their time to field activities. This is apportioned among the several principal methods employed in the field, as nearly as can be estimated, approximately as follows: extension schools, 10 per

cent; lectures, 25 per cent; demonstrations, 20 per cent: conferences and conventions, 20 per cent; inspections, farm visits, and miscellaneous activities, 25 per cent. It should be emphasized that these divisions are average and include rather wide variations as between the several departments.

Where the line of demarcation should be drawn between a demonstration and a lecture is not clear. Many of the lectures are illustrated by lantern slides, blackboard diagrams, charts, and manipulative demonstrations. To the figures for lectures already given, however, should be added about an equal number of meetings classified as demonstrations. Attendance at the purely demonstration meetings aggregates only about half the attendance at lectures. Many of these meetings are held in barns or in fields for a small neighborhood group.

The table appended to this report shows the number of meetings of various classes held during the fiscal year 1926-27, and the attendance at those meetings.

Farm and home institutes. The first of the farm and home institutes (formerly called *farmers' institutes*) in this State was held at Cornell University on February 16, 17, and 18, 1886. The movement was started by the State Agricultural Society, in cooperation with the State College of Agriculture. For six years the secretary of that society acted as director of the institutes and had charge of the funds appropriated by the States for the purpose.

The directors under this arrangement were: in 1887-88, J. S. Woodward; in 1889-90, J. F. Converse; in 1890-93, George T. Powell. In 1893 the State Department of Agriculture was established by law. Under the provisions of this law the Commissioner of Agriculture was to appoint a director of farmers' institutes. George A. Smith was thus appointed and held office from 1893 to 1896, and F. E. Dawley from 1896 to 1908.

In 1908 Raymond A. Pearson, of the State College of Agriculture, was appointed Commissioner of Agriculture. Under his administration the institutes were chiefly directed by the following conductors: Edward VanAlstyne, F. E. Gott, Jared VanWagenen, C. H. Tuck, T. B. Wilson, and D. P. Witter, each having a group of counties under his charge. In 1912 Calvin J. Huson, then Commissioner of Agriculture, appointed as director of institutes Edward VanAlstyne, who held this position until his death in January, 1918. In that year the Legislature transferred the appropriation for this line of educational work to the State College of Agriculture, and D. P. Witter has since acted as advisor in institute extension for the College. Thus the farmers' institutes, for a period of more than forty years, have been directed in the main by practical farmers.

By request of Commissioner Pearson in 1909, D. P. Witter wrote a history of farmers' institutes which was printed in the annual report of farmers' institutes of that year. That report may be consulted for further details.

From the first this type of educational work proved its worth. For several years it was practically the only means for disseminating to farmers, homemakers, and others, the scientific knowledge gained by the College of Agriculture and the State Experiment Station.

For several years a representative of the State Department of Education attended nearly every institute and presented the benefits of improved

conditions in the rural schools. These lectures have had great influence on the forward-looking people in rural communities toward the bettering of their school conditions.

In connection with the teaching given in farmers' institutes, a system of field demonstrations and farm-to-farm teaching was inaugurated in 1909 which prepared the way for the establishment of the first farm bureau in 1911. Then followed the home-bureau and the junior-project work. Thus the farmers' institutes have been the forerunner of these various agencies and other lines of extension work now carried on under the direction of the State College of Agriculture.

The long-continued popularity of these meetings is due largely to the excellence of the subject matter presented, the able manner in which it is given, the inspiration received from it, and the determination of the extension staff to keep these meetings modernized in every respect.

The College furnishes material for newspapers which circulate in the community where institutes are to be held, giving a brief sketch of each speaker, and other news items pertaining to the institutes. Large posters are furnished, as is also a printed program.

The cost of an institute to the local community is determined by the same zone system of sharing traveling expenses as is used in other forms of extension work. In addition the local people are expected to furnish a good hall for the meeting, properly warmed and lighted.

The subjects for discussion are selected with great care and are made to harmonize with the farm- and home-bureau programs for the year. All subjects pertaining to the betterment of farm, home, and country life are admissible, and are discussed if requested. The county agricultural agent, and the home demonstration agent if there is one in the county, are expected to be present and to take part in the discussions.

The amount of this type of extension work varies somewhat from year to year. The number of days devoted to regular meetings of this type in 1926-27, as called for by the people, was 121. The total attendance was 6031, an average of 50 a day.

The number of speakers employed in institutes last year was 21, including 10 college specialists. The greater part of the work was done by men and women whose chief business is farming but who are employed by the college for the institute season. All of the speakers have had college training, and have proved qualifications for the work.

County fairs. The fair as an agricultural institution has long since passed its one-hundredth birthday. Exhibits hold a well-recognized place as one of the means for presenting timely information. For the past twenty years the College has had subject-matter exhibits at the State Fair, and formerly it had them at many of the county fairs. These exhibits, prepared by the various departments, have been designed to show the results of some phase of experimental work under way at the College.

In recent years the College has ceased to furnish much exhibit material for county fairs. The several county-agent offices now provide larger and better county exhibits, at less cost, than the College could furnish. Probably the most important contributions which the College has made to county fairs are the furnishing of judges, premium-list revisions, and

improvement brought about in "Midway" attractions through educational propaganda and introduction of the "Little Country Theater."

Premium lists have been studied and recommendations made to simplify the classes and make them better suited to the existing agriculture in the community served by the fair. A recent survey of the premium lists of 62 fairs showed that some of the recommendations made by the College had been adopted in practically every one.

Judges are furnished each year to 25 or 30 county fairs. Appointments are now generally made conditional on premium-list revision to conform with college recommendations, and provisions for handling the judging as a demonstration. Much improvement in the quality and character of exhibits of livestock and farm products has resulted from these efforts. During the fair season of 1926 the College supplied judges to 45 county or community fairs in 38 counties aggregating 117 days of work. In addition the College customarily supplies a number of judges and superintendents of departments at the State Fair.

The 4-H club work has been very generally recognized by the fair associations of the State. Club leaders have taken a very active part in getting the girls and the boys to show their products, give demonstrations and conduct contests, and in other ways to stimulate interest and desire in these girls and boys to strive for excellence in whatever venture they may undertake.

Demonstration trains. In New York the "farm train" has not been employed to the extent that it has in the Middle West. The first "farm special" in New York was run over the Erie and New York Central lines in 1909. Exhibits, lectures, and demonstrations are the main features of the program. It is of course possible to carry, from point to point, livestock of various types, and larger quantities of other illustrative material than can otherwise be economically assembled at local meetings. All of the principal railroads in the State, the express companies, and other handlers, have cooperated with the College in this project at different times. An example of one of the most useful demonstration trains was one operated over the New York Central lines in western New York during the winter of 1926-27 primarily for the purpose of demonstrating to growers how to grade, pack, and load apples and other fruits, including instruction on storage, shipping, and marketing.

Indian extension. One member of the administration staff organizes and supervises extension work on the several Indian reservations in the State. During the few years in which extension teaching in agriculture has been given to these people, substantial progress has been made, especially on two reservations, in fostering a better type of agriculture and in developing future leadership of promise.

Each winter for the past several years a carefully selected group of young Indians has attended the winter courses, some of them returning for two or three successive years. Special attention has been given to these young men by the advisor in Indian extension, who has helped them to choose their courses and has encouraged and tutored them through the difficult places. So far, nearly all of these young men (and two or three young women) have returned to their reservations, where they have served creditably in arousing among their elders a desire for better living.

conditions through adoption of improved farm practices and the introduction of better strains of livestock and better crop varieties. One of these short-course boys translated the spray service into the Tuscarora language for the benefit of those who do not read English. On the Tonawanda reservation a very marked change was brought about through increased plantings of fruit of better varieties, the intelligent use of spraying materials, pruning, and other recommended practices. Some of these Indian farmers now rank fairly high among the fruit growers of western New York. Dairymen on the St. Regis Reservation have organized a local branch of the Dairymen's League. The Allegany Senecas, in three years time, pledged their reservation to the eradication of tuberculosis and adopted a poultry program to tide them over the test period. On all the reservations so-called Cornell-Indian boards have been elected as group leaders. They have rapidly assumed responsibility and are functioning efficiently.

Farmers' Week. "An idea grown big." "Where science meets practice and the result is a better rural civilization." "The aim of Farmers' Week is to make a worth-while contribution to the educational efforts to build a better rural citizenship." These are some of the characterizations of Farmers' Week. Twenty years have witnessed the growth and development of a permanent annual event known not only throughout our own State but to a considerable extent throughout many adjoining States and Canada, as a survey of the registration cards will show.

Although Farmers' Week may have been the outgrowth of several concurrent factors, it was due in the main to the clear vision of Liberty Hyde Bailey, former dean of the College, who, early in his administrative relationship to the College, saw the need of bringing together those who were interested in all branches of agriculture, that they might hear and discuss the latest information and practices applicable to their problems. The Agricultural Experimenters' League of New York, an association of farmers, many of whom were former students of Cornell, was formed in 1900. The members of this organization were to conduct tests and experiments on their farms and to report the results at the end of the year. These results were usually summarized and published. As the League developed, an annual meeting was held to which the members brought their reports, and here they discussed the reports and had added to their program discussions by members of the college and experiment-station staff. In 1907 this annual meeting was considered of sufficient importance and of such state-wide interest as to make it worth while to open it to others than members, and Farmers' Week was proposed; and the next year, 1908, saw the first Farmers' Week held in New York.

The attendance at the first Farmers' Week, in 1908, was placed at 800. In 1914 it had climbed to 3500; in 1921 there were 4116 persons actually registered; and in 1927 a total of 5087 persons voluntarily came to the two registration places in Roberts Hall and the Home Economics Building and signed the registration card. Since this event is always held during the second week in February, the fluctuation in registration from year to year can very largely be traced to good or adverse weather conditions. However, since 1915 the attendance has fallen below 3000 only once, in 1920, when it was 2790.

SUMMARY OF EXTENSION SPECIALISTS' FIELD ACTIVITIES FROM JULY 1, 1926, TO JUNE 30, 1927

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Number of farm and home visits	Conferences		Lectures		Miscellaneous (number of days)	Number of teaching contacts
		Number	Attendance	Number	Attendance	Number	Attendance		Number	Attendance	Number	Attendance		
Agricultural Economics	519	15	127	1	4	.....	.....	451	28	427	413	16,508	53	17,577
	404	.....	.....	13	59	.....	.....	1,382	46	2,325	328	7,578	26	11,344
	738	344	50,243	7	22	.....	.....	932	91	525	577	23,263	82	74,085
	99	26	230	3	31	.....	.....	47	12	432	15	938	39	1,668
	179	8	446	9	329	.....	.....	245	83	643	115	12,369	6	14,032
	49	.....	.....	1	8	.....	.....	5	18	95	29	1,455	2	1,563
	225	58	1,268	7	125	.....	125	273	65	467	78	7,291	58	9,551
	207	18	96	21	237	.....	.....	413	9	23	34	781	48	1,350
	176	80	1,766	.....	.....	.....	.....	244	51	150	173	2,377	44	4,537
	217	109	3,769	30	524	.....	.....	353	190	1,764	71	6,550	14	12,900
	673	199	4,244	24	381	.....	25	539	73	508	441	14,330	91	20,027
	5	.....	.....	.....	.....	.....	.....	.....	1	50	4	430	.....	480
	723	1,180	21,503	47	394	.....	52	383	18	434	48	1,069	19	23,835
	216	9	484	36	2,447	140	4,905	8	87	2,153	49	6,630	24	16,617
Miscellaneous	286	13	516	7	689	3	38	166	51	427	356	24,892	41	25,928
	97	.....	.....	.....	.....	.....	.....	.....	.....	.....	81	3,603	36	3,603
	4,806	2,059	84,682	206	5,250	151	5,145	5,443	823	10,423	2,812	129,314	583	210,257
	1,135	234	11,624	177	4,685	497	7,169	227	693	1,899	478	24,303	34	49,907
Total agriculture	5,941	2,293	96,306	383	9,935	648	12,314	5,670	1,516	12,322	3,290	153,617	617	290,164
Total specialists	1,434	.....	.....	.....	.....	101	2,233	.....	1,893	11,455	739	138,173	137	151,861
Total administration	7,375	2,293	96,306	383	9,935	749	14,547	5,670	3,409	23,777	4,019	291,790	744	442,025

In 1908 there were 99 events scheduled on the program. These were mainly lectures; there were a few round-table discussions and a few departmental exhibits, but practically no entertainment features. In 1927 there were 494 lectures, demonstrations, round-tables, practice periods, exhibits, and entertainment features, and these last-named features have continued to play an important part in the Farmers' Week programs of the past twelve years.

Farmers' Week stands alone in any general classification of meetings. Here we have brought together in one program the very latest information of research and practice, not only of farming and homemaking problems, but also of those questions that touch the very life of every community. Everyone, whether a farmer, a homemaker, a rural pastor, a teacher, a student, a community leader, or a business or professional man or woman, should find something of interest at this meeting. It has been considered an unusual opportunity for discussing state- and nation-wide problems with a large number of persons, and without doubt has had a tremendous significance in the agricultural progress of the State. It has been at Farmers' Week that we have seen the beginnings of several state associations, such as the State Drainage Association and the State Rural Engineering Association, which were at one time rather prominent. The State Vegetable Growers Association and the State Farm Bureau Federation had their foundation stones laid at Farmers' Week. The National or American Farm Bureau Federation also had its conception here at a Farmers' Week. Many policies have been formulated by groups of agricultural leaders meeting in unscheduled conferences, and without question subsequent agricultural programs have been very materially guided by these group meetings.

Farmers' Week is not a function of the extension service of the College alone, nor of the research or teaching group, but of all these, taken together with our other big component part, the student body. All are hosts to our Farmers' Week guests. The students should have special mention, as their work, though unscheduled and unheralded, through well-organized committees of registration, information, checking, rooming, and so forth, plays a very important part in making the week a success.

If Farmers' Week were to have a slogan, it might be "The best presented by the best."

Junior Field Days. Junior Field Days, an outgrowth of the Farmers' Field Days started in 1920, have now become as much of an annual event as Farmers' Week. They were held this year on June 22, 23, and 24, and surpassed all previous field days from the standpoint of attendance and general all-round success. The total registration was 1925—1198 girls and 727 boys. In 1922, when the Junior Field Days were started, about 400 girls and boys were present. The attendance has steadily increased each year. Although the meetings are held mainly for girls and boys enrolled in 4-H club work, the program offered at Field Days is open to all girls and boys of the State.

The aim of Field Days has been to stimulate in the girl or the boy a desire for further knowledge. The programs have contained some subject matter bearing upon 4-H club projects, some new subjects, a few very

general talks, and some entertainment, athletics, and games to make the three days pleasant as well as worth while.

Although up to the present time there has been no definite selective basis for attendance, the increase in numbers during the past two or three years does raise the question as to whether some such plan should be adopted. Possibly some outstanding achievement in club work, or completion of a project, or length of time enrolled, might be used.

Publications

Serving the public through print. The real beginnings of an office of publication for the College of Agriculture came with the start of the calendar year 1915. This office, which was most closely connected with the extension service but was affiliated with, and serving, the experiment station, and later became connected with resident teaching through courses in agricultural journalism, has ranked as a department of the College since that date.

Before that time, partly through personnel reasons, the editorial work on bulletins was conducted through the office of the secretary of the College, and was ably handled as is attested by the high place always accorded to the Cornell publications in agriculture, home economics, and nature study. Contacts with the press were less developed at the time, but a four-page monthly paper, the *Announcer*, went to former students, to the press, and finally to those members of the public who requested its periodical visits.

New developments. On December 10, 1914, the Office of Publication was organized as a separate unit and was under way, issuing a mimeographed news service to the papers of the State as its first new venture, and continuing the editorial revision, publication, and distribution of bulletins.

Shortly thereafter, at the request of students who wanted to prepare themselves for agricultural journalism, a single one-hour course without credit was tried, and this proved so successful that now there are five courses, with an aggregate of eleven credit hours.

News service. The news service, from the first, marked a distinct departure from such ventures. It was never a publicity service, never a "press-agenting" of the institution or of individuals connected with it. It never fell under the disfavor of the newspapers as a "space-grafter," endeavoring to get free advertising at their expense, because it dealt with legitimate and interesting news, prepared by trained journalists in newspaper style and from the point of view of a local correspondent or newspaper representative at the College instead of a propagandist for the College. In short, the news service has never attempted to "work" the papers, but to work for them.

Through the American Association of Agricultural College Editors (of which the Cornell editor has been a member since 1914, and was president in 1918) and the American Association of College News Bureaus (of which the Cornell editor was president in 1920), the idea of news, and nothing but news, has been carried over to other agricultural colleges, and all ideas of publicity—and the camouflage of such titles as counsellor in public relations—has been discarded for a frank attitude of helping the

papers to get helpful facts that their public wants to read, thus making the papers grateful for a service to them, rather than resentful at being expected to render a service to the College. This idea of service to papers and their readers has been carried further by the graduates of the courses in agricultural journalism who have become agricultural editors or news writers at the state colleges of Ohio, Michigan, New Jersey, and Kansas.

In connection with this service to the rural press, the College has recognized in the country weekly one of the most valuable agencies in rural advancement, and has therefore done all that it could to advance the interests of the country weekly: first, through a monthly periodical of helpful hints, known as the "Service Sheet"; secondly, through the publication of five bulletins dealing with the problems of country weeklies; and thirdly, through annual conferences and newspaper contests held at the College for newspaper editors and publishers.

Study courses. Soon after the department was organized it took over the home study courses—which were correspondence courses only in name and not in fact, because nothing was required of the correspondence courses beyond a mere reading of the bulletins, which were designated simply as "Reading Courses for the Farm" and "Reading Courses for the Home." A regular series of courses was established, using textbooks and bulletins; and a series of lessons were outlined by the extension specialists in subject-matter departments, who then graded and commented upon the papers prepared by the correspondence students. The successful completion of a course carries with it a certificate of such completion. All executive work, such as handling correspondence, advertising the courses, and, in general, filling the place of a liaison office between the student and the department from which his instruction is derived, is handled in the Office of Publication by the supervisor of study courses. The study courses have become genuinely helpful, and the supervisor receives many letters of gratitude from students who have profited by this help.

Visual instruction. Within the past year the handling of materials for visual instruction—lantern slides, motion pictures, and the like—has been combined with the study-course office; and this branch is being currently expanded to include a working file, or library, of all illustrative material at the College.

Interrelations. The work of the office is so much one of service to other departments of the three activities of research, extension, and resident instruction, that the interrelation and interweaving is hard to describe. For example, the editorial section takes the manuscripts of the scientific investigators, prepares them for the printer, sees them through the processes of publication, and then distributes them. It does a similar service for the nontechnical bulletins, advertising them to prospective readers so that now, as a development of the past four years, these are all sent out in response to individual requests rather than to lists, which involve a wasteful distribution. The news service emanates primarily from the several departments, and no item is sent out without departmental approval in its final form.

For all the extension services, of demonstration agents for farm and home, and for junior extension, the office edits and issues a monthly organ,

the *Extension Service News*, to maintain a solidarity and esprit de corps in the whole extension service. The office sends out also a monthly news service, furnished by extension specialists, for use in the publications printed by the agents in their respective counties.

Pioneering efforts. The most significant contributions made by the Office of Publication, or perhaps the most interesting from the point of view of pioneering in its field, are: the aid it gives to the country weekly as a rural influence, which advances the community in which it circulates along with church, school, grange, farm bureau, home bureau, and library; the development of really solid and substantial correspondence courses meant for those who can put teachings into practice; the system of bulletin distribution, by which publications reach those persons who ask for them and who therefore know what they want; the development of fundamental courses in agricultural journalism, which in twelve years have trained at least sixty persons who now occupy high positions in the journalistic field, mainly connected with agriculture; the training of news writers, through extension schools for representatives of agricultural organizations and for country correspondents of the rural weeklies, to the writing of more significant, constructive, and interesting news from farming sections; the actual education of the editors of country weeklies, through conferences, contests, and the "Service Sheet," to the value of farm news; the typographic improvement of the bulletins.

Needs for the future. The greatest outstanding need for the future is related to the growing dependence on pictures—photographs to be used as illustrations in publications and syndicated news services, engravings to be circulated by exchange between farm-bureau papers and other periodicals and pictures for visual instruction.

The College has many valuable prints and negatives, of which there is no centralized record and therefore no one knows what is available and what is needed. An illustration file in the Office of Publication would make all of this material available, without taking the negatives and source material from the departments in which they are now housed. The Office of Publication should provide for a section of illustrative material, to make readily available this wealth of material and to include also provision for an illustrator to give uniformity, skill in drawing, and adaptability to printed reproduction, to the increasingly large number of graphs, diagrams, designs, and posters for publication. Many of these are poorly prepared by the authors who submit manuscripts; some are submitted as pencil sketches entirely unsuited to reproduction; almost all need retouching or improvement in lettering, and this has to be done somewhat haphazardly on a piece-work basis.

An illustrator at a comparatively small salary, and a file clerk, or illustration librarian, would give a satisfactory working force for an illustration section that would be adequate for a good many years to come. The only additional cost in equipment would be for filing cases, record-bearing cards on which the photographic or other illustration material could be mounted, and a set of index cards to make the collection readily accessible to all.

The College now has 1860 engravings in its "cut exchange," for the use of county agents, and a much larger number whose storage has be-

ne such a problem with the state printer that he has asked to be relieved the burden. Scarcely a day passes without a request from book or gazette publishers for the use of the illustrative material of the College. **The current year.** The greatest development of the work of the office the fiscal year just closed has been in connection with the demand for feature articles, with pictures, for newspaper syndicates. The Newspaper Enterprise Association, with a plate service to papers having an aggregate circulation of 5,000,000 copies, has been supplied for some time. Now the Associated Press comes forward with a similar weekly illustrated agricultural news service to papers with a total circulation of 13,000,000. These channels of extension through print, in the one medium which everybody reads—the newspaper—are being used now, but could be used more fully and advantageously if the illustrated material were more readily available.

Preparation of students. Students in the courses in agricultural journalism are being prepared for the rural field; but, since the fundamentals of journalistic training do not differ in respect to the work done, not all who have had agricultural journalism “stay put” in recording farm activities. However, the journalism courses have to their credit the following: agricultural editors in four state universities; an associate editor of *Farm and Fireside*; two advertising men on the *American Agriculturist*; the head of the agricultural-books department of the Macmillan Company; the managing editor of *The Field*; several men in agricultural advertising; the head of the advertising and publicity department of the H. O. Company; a manager and publicity director of radio station WGR; reporters on the New York *World*; city editors on Springfield (Massachusetts) and Brooklyn papers;—to mention only a few of the sixty who are more or less directly connected with journalism. Four of these students have worked in the Office of Publication of the College of Agriculture, and two are still there rendering excellent service. Two who had hotel-management courses have gone into hotel publicity; one is furnishing news and supervising the publications for the College of Home Economics; one is on the *Wall Street Journal*; two are on the *Philadelphia Public Ledger*; and at least a dozen are conducting creditable *Farm Bureau News* organs.

Even with the development of such new agencies as the radio and the motion pictures, the printed word is becoming more and more depended on for reliable information. Farmers are reading more, and are accepting more of what they read, because the bulletins and news service from the College have put a new reliability into agricultural information. Of those who have taken correspondence courses, the greater majority have had their attention called to them by articles that their local papers printed by direct advertising through print. Henceforth the development in the printed word must be toward greater attractiveness, and the College must be able to meet this demand in competition with all of the other agencies which are appealing to the public.

Bulletins and reports. The bulletins and reports, of both research and popular character, which have been issued during the year and are to be considered a definite part of this report to the people, are as follows:

		Number of pages in printed publication	Rate of cost per page
MEMOIRS :			
100	A study of Pogoniris varieties (Floriculture and Ornamental Horticulture)	159	4.50
101	A list of the insects of New York, with a list of the spiders and certain other allied groups (Entomology and Limnology)	1,121	5.00
102	A cytological study of two types of variegated pericarp in maize (Botany).....	14	4.00
103	The growth of certain microorganisms in planted and in unplanted soil (Agronomy).....	25	4.00
104	Pasture studies (Plant Breeding).....	59	4.50
105	The manufacture of Cheddar cheese from milk pasteurized by the holder method (Dairy Industry).....	36	4.50
106	Catalase in relation to growth and to other changes in plant tissue (Botany).....	63	4.50
107	Experimental studies of cultivation of certain vegetable crops (Vegetable Gardening).....	73	5.00
108	Studies of the influence of menhaden-fish meal on calcification in growing animals (Animal Husbandry).....	23	4.00
Total		<u>1,573</u>	<u>40.00</u>

EXPERIMENT-STATION BULLETINS :

451	The relative efficiency of some copper dusts and sprays in the control of potato diseases and insect pests (Plant Pathology)	68	6.00
452	Economic studies of dairy farming in New York. VI. Grade B milk with cash crops and mixed hay roughage, crop year 1922 (Agricultural Economics and Farm Management)	58	6.00
453	An economic study concerning the operations of fruit and vegetable shippers in western New York (Agricultural Economics and Farm Management).....	67	8.00
454	The spruce gall-aphid (Entomology and Limnology).....	17	4.00
455	Economic studies of dairy farming in New York. VII. Grade B milk with cash crops and mixed hay roughage, crop year 1923 (Agricultural Economics and Farm Management)	51	6.00
456	Sunflowers as compared with corn as a silage crop for New York (Plant Breeding).....	29	7.50
457	An index number of farm taxes in New York, and its relation to various other economic factors (Agricultural Economics and Farm Management).....	47	8.00
458	The climate of Long Island: its relation to forests, crops, and man (Meteorology).....	20	6.00
Total		<u>357</u>	<u>51.50</u>

READING-COURSE LESSONS FOR THE HOME :

87	(Reprint) The decorative use of flowers (Floriculture and Ornamental Horticulture)	24	5.00
126	(Reprint) How to keep a cash account (Home Economics)	8	2.50
Total		<u>32</u>	<u>7.50</u>

	Number of pages in printed publication	Number of copies printed
EXTENSION BULLETINS:		
31 (Revised reprint) The European corn borer (Entomology)	17	10,000
47 (Revised reprint) List of publications for general distribution (Extension Service)	12	74,000
49 (Reprint) Estimating the value of timber in the farm woodlot (Forestry)	28	3,000
56 (Revised reprint) Strawberry culture in New York State (Pomology)	18	5,000
52 (Reprint) Hitches, knots, and splices (Rural Engineering)	76	10,000
72 (Reprint) Transmission of power by means of pulleys, belts, and shafts (Rural Engineering)	42	10,000
73 (Reprint) Rearing calves and heifers (Animal Husbandry)	20	7,000
74 (Reprint) The family garden (Vegetable Gardening) ...	34	7,000
88 (Reprint) How to use apples as food (Home Economics)	18	5,000
90 (Revised reprint) Artificial illumination of poultry houses for winter egg production (Rural Engineering)	29	5,000
18 (Reprint) Reducing the feed cost of milk production (Animal Husbandry)	18	7,000
24 (Reprint) Dairy improvement associations (Animal Husbandry)	28	5,000
39 (Reprint) Plans of Cornell poultry houses and appliances (Poultry Husbandry)	36	10,000
48 Coccidiosis and bacillary white diarrhea of chicks (Poultry Husbandry)	13	10,000
49 Feet and shoes (Home Economics)	12	5,000
50 Children's clothing (Home Economics)	17	5,000
51 Dairy-stable ventilation (Rural Engineering)	35	5,000
52 An outline of the New York State system of taxation (Agricultural Economics and Farm Management)	21	8,000
53 Rearing chickens (Poultry Husbandry)	29	5,000
54 Top-working and bridge-grafting (Pomology)	23	10,000
55 Grinding farm tools (Rural Engineering)	34	5,000
56 How to make and use an operating statement (Agricultural Economics and Farm Management)	31	5,000
Total	591	216,000

SENIOR EXTENSION BULLETINS:

3 (Reprint, supplement only) Dairy club project record (Dairy Industry)	4	1,500
6 (Reprint, supplement only) Potato club project record (Vegetable Gardening)	4	5,000
11 (Revised reprint, supplement only) Garden club project record (Vegetable Gardening)	4	8,000
12 (Revised reprint) Poultry keeping for junior poultrymen (Poultry Husbandry)	45	7,500
(Reprint, supplement only) Poultry club project record (Poultry Husbandry)	4	4,000
13 (Reprint) Tying knots and splicing rope (Rural Engineering)	24	5,000
17 4-H club member's record book — first-year homemaking (Home Economics)	13	12,000
18 4-H club member's record book — foods and nutrition, elementary (Home Economics)	12	5,000

	Number of pages in printed publication	Number of copies printed
19 4-H club member's record book — foods and nutrition, advanced (Home Economics).....	9	5.00
20 4-H club member's record book — clothing and health, elementary (Home Economics).....	15	10.00
21 4-H club member's record book — clothing and health, advanced (Home Economics).....	14	10.00
22 4-H club member's record book — home furnishing, elementary (Home Economics).....	8	5.00
23 Kimono garments for 4-H club girls — a manual for 4-H club members and readers (Home Economics).....	27	15.00
Total	183	93.00
RURAL SCHOOL LEAFLETS:		
September, 1926 (Rural Education).....	154	25.00
November, 1926 (Rural Education).....	52	150.00
January, 1927 (Rural Education).....	62	150.00
March, 1927 (Rural Education).....	64	150.00
Total	332	475.00
MISCELLANEOUS:		
(Reprint) How to take a farm inventory and make a credit statement (Agricultural Economics and Farm Management).....	22	5.00
(Reprint) How to keep an account with a crop (Agricultural Economics and Farm Management).....	15	5.00
Food selection and health habits — score card for boys and girls, 6 to 18 years of age (Home Economics).....	2	30.00
Health record for boys and girls, 6 to 18 years of age (Home Economics)	2	20.00
Household cash account (Home Economics).....	64	5.00
The apple situation in New York State (Agricultural Economics and Farm Management)	44	3.00
Program of the twentieth annual Farmers' Week, 1927.....	66	12.00
New York 4-H clubs secretary's record book.....	64	5.00
Total	279	85.00
ANNUAL REPORT for 1926, College of Agriculture.....	73	3.80
ANNUAL REPORT for 1926, College of Home Economics.....	28	4.00
Total	101	7.80
ANNOUNCEMENTS:		
Announcement of the New York State College of Home Economics, 1927-28.....	38	6.00
Announcement of winter courses, 1926-27.....	36	0.00
Announcement of winter courses, 1927-28.....	34	6.00
Announcement of the courses in hotel administration, 1926-27..	14	.50
Total	122	21.80

SUMMARY

	Total number*	Total pages	Copies
Memoirs	9	1,573	40,000
Experiment-station bulletins	8	357	51,500
Reading-course lessons for the home.....	2	32	7,500
Extension bulletins	22	591	216,000
Junior extension bulletins.....	12	183	93,000
Rural school leaflets.....	4	332	475,000
Miscellaneous	8	279	85,000
Annual reports	2	101	7,800
Announcements	4	122	21,800
Total	71	3,570	997,600

* Including reprints.

Farm bureaus

The first conception of the farm bureau in New York may be traced to Broome County, where in the summer of 1910 a committee composed of members of the Binghamton Chamber of Commerce and representatives of the Delaware, Lackawanna, and Western Railroad conceived the idea of employing a trained agriculturist to advise and confer with farmers in the district relative to better methods of crop production and farm management. The United States Department of Agriculture and the State College of Agriculture approved the plan and cooperative relationships were established. On March 1, 1911, John H. Barron (now an extension professor at the New York State College of Agriculture) was employed as the first county agent in New York. This was the beginning of the first farm bureau organized in the United States. From the beginning farmers have accepted a large share of the responsibility for making programs and directing the work in the various counties.

The work has grown from the beginning made in 1911 to the present time, when bureaus are organized and agents employed in all of the fifty-five agricultural counties in the State. County boards of supervisors have seen the value of the work and are loyally supporting it. In 1927 the counties made available a total of \$218,645 for the support of the work—an average of \$3975.70 per county. From year to year gradual increases in the amounts of money available have been made.

The county agent and the farm bureau have become important influences in the agriculture of the various counties. Programs have become more definite, and include practically all lines of educational work of value to the State's agriculture. The extent to which the work is touching rural life is indicated by the following facts: there are 6000 farmers acting as voluntary local leaders in furthering improved agricultural practice; during the past year county agents made 44,416 personal visits to farmers, office calls relating to the programs amounted to 56,205, telephone calls numbered 59,326, and 101,567 personal letters were written; the number of farmers' meetings organized was 5834, with an attendance of 251,560.

Leading farmers throughout the State are not only using the information available but are also supporting the program through membership in the farm bureau. In 1926 the membership in the State was 28,476. Indications are that this number will be exceeded by about 1000 in 1927.

Increasing demands on the part of farmers for more service and information have to be met daily. The information must be accurate and the service prompt. If the situation is to be adequately met in the coming years, it means additional financial support from state and federal sources.

The farm bureau and the county agent have become an established institution in the counties. Rural people look forward to receiving the service as a matter of daily life. Development in agricultural practice, and changing economic conditions, are ever presenting new problems and the field of activity is yet young.

Junior extension

Organized junior extension, or 4-H club work, dates from February, 1916, with the appointment of F. L. Griffin as extension professor of rural education and state club leader. This was immediately preceding the entrance of the United States in the World War, and for the following two years the club work partook in some measure in the inevitable campaign for increased food supply and conservation. With the wartime enthusiasm and the stimulation of special wartime appropriations, club work developed rapidly, until in 1918 the enrollment reached a total of 21,840 young persons with 17,997 completing the work. Local supervision at that time was largely vested in volunteer local leaders, most of them being school superintendents and teachers anxious to do something to help win the war.

At the close of the war much of this volunteer leadership lost its enthusiasm and the problem then resolved itself into two phases: (1) an attempt to hold the interest of school officials and teachers by giving emphasis to the educational values of club work conducted in connection with the regular school program; and (2) an attempt to build up a system of paid county leadership. About this time the post-war depression developed, food production became greater than the demand, and the special wartime appropriations were reduced or eliminated altogether.

In 1920 the club enrollment had fallen to 11,856, though a large part of this reduction was in city garden-club membership which had been promoted with special emphasis during the war period. During the period, 1918 to 1920, considerable progress was made in local and county supervision, with the result that all enrolled club members were reached with group or club instruction and by individual home visitation.

From 1920 there has been a gradual increase in paid county leadership, a closer cooperation with the school system, and yearly increases in club membership, until during the past year twenty counties have employed one or more full-time county club agents and the enrollment of club members has reached a total of 16,904, with 12,429 carrying through to completion. While by far the greater part of the club work conducted was in the twenty counties with county club agents, more or less work was done in forty-five counties. Present indications are that there will be a material increase in the number of young persons, mostly farm people, reached through junior extension activities during the present year.

Some curtailment in supervision has been necessary during the year because of the resignation of Paul R. Young as assistant state club leader last November, the vacancy not having been filled until April. John A.

Reynolds, a former county club agent with subsequent graduate training and teaching experience, is now acceptably filling this position.

Probably the greatest need at present is for suitable handbooks outlining the aims, plans, and procedure in junior-extension work for the guidance of local leaders, 1373 of whom have given of their time and assistance during the past year. This need will be supplied in part by publications now in preparation.

Appropriations by boards of supervisors for the maintenance of junior-extension work in counties maintaining county club agents have been fairly adequate with one or two exceptions. The total appropriations by county boards of supervisors for the year were \$62,500. The total budgets were \$106,502.70.

Some changes in the program of projects and the method of supervision have been made during the year. The livestock program has been expanded and strengthened, a third project in farm shop has been developed, and a new project in farm accounting has been perfected. The homemaking program for juniors has been entirely rearranged. Further particulars regarding these changes appear in the reports of subject-matter departments directly concerned.

In general, junior-extension activities seem to receive the hearty support of farm young people and their parents, and for the most part excellent cooperative relationships have been maintained with other interested organizations. Doubtless more rapid growth might be obtained by a more aggressive action on the part of the state leader's office. The policy, however, has been to cooperate with counties and communities expressing the desire for assistance, rather than to unduly promote a more or less transient interest.

A change in the cooperative relationship with the State Department of Education affecting county administration of junior-extension activities, mentioned in the report for 1926, has not progressed far enough to warrant any positive statement as to its effectiveness.

The following table gives data relating to the 4-H club work in the State during the year:

4-H CLUB WORK IN NEW YORK IN 1926

County	Number enrolled			Number completing work			Per cent of completion		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Albany.....	152	66	218	127	27	154	83.5	40+	70+
Allegany.....	120	15	135	83	1	84	69+	66.6	62+
Broome.....	56	2	58	47	.....	47	84	.....	81+
Cattaraugus.....	90	61	151	45	33	78	50	54	51+
Cayuga.....	70	32	102	49	16	65	70	50	63+
Chautauqua.....	386	219	605	333	191	524	86+	87	85+
Chemung.....	614	755	1,369	344	392	736	56	52	54+
Chenango.....	530	616	1,146	492	504	996	93	82	86+
Clinton.....	50	17	67	48	14	62	96	82	93+
Columbia.....	47	35	82	30	23	53	64	66	65+
Cortland.....	50	75	125	42	63	105	84	84	84
Delaware.....	420	529	949	314	307	621	75	58	65
Dutchess.....	336	300	636	300	350	550	89	83	86
Essex.....	9	3	12	5	.....	5	55	.....	41+
Franklin.....	29	7	36	21	5	26	73	71	72
Genesee.....	253	302	555	200	242	442	79	80	79
Jefferson.....	674	684	1,358	582	578	1,160	86	84	85+
Lewis.....	47	30	77	37	23	60	79	76	78+
Livingston.....	296	253	549	199	216	415	67+	85	75+
Madison.....	.....	106	106	.....	98	98	.....	92	92
Monroe.....	263	404	667	221	322	543	84	79	81
Montgomery.....	48	57	105	45	53	98	93+	93	93
Nassau.....	245	466	711	120	235	355	49	50	49
Oneida.....	319	348	667	240	248	488	75	71	73
Onondaga.....	406	351	757	328	238	566	80	67	74+
Ontario.....	331	373	704	259	296	555	78	79	79+
Orange.....	270	336	606	214	250	464	79	74	76+
Orleans.....	.....	6	6	.....	6	6	.....	100	100
Oswego.....	436	460	896	346	338	684	79	73	76+
Otsego.....	409	522	931	319	364	683	78	69	73+
Rensselaer.....	284	311	595	260	247	507	91+	79	85
Rockland.....	.....	23	23	.....	20	20	.....	87	87
St. Lawrence.....	38	18	56	26	11	37	68	61	66
Schuyler.....	173	168	341	140	139	279	80	82	81
Steuben.....	233	38	271	151	15	166	65	39	61
Tioga.....	18	.....	18	11	.....	11	61	.....	61
Tompkins.....	212	208	420	156	119	275	73	57	65
Ulster.....	.....	2	2	.....	2	2	.....	100	100
Wayne.....	62	35	97	21	22	43	33.8	63	44
Westchester.....	.....	63	63	.....	38	58	.....	92	92
Wyoming.....	318	314	832	219	167	386	68	53	61
Total.....	8,294	8,610	16,904	6,374	6,133	12,507	77	71	74

Departmental extension activities

The departmental extension activities are reported in the following pages.

Agricultural Economics and Farm Management

Members of the Department of Agricultural Economics and Farm Management have, alone or in cooperation with other departments, conducted during the past year five extension schools. The total attendance at the different sessions of the schools amounted to 496. During the year 429 lectures and demonstrations were given, with a total attendance of 16,699. These lectures were given at extension schools, farm-bureau community meetings, farmers' institutes, meetings of chambers of commerce and rotary clubs, grange meetings, and meetings of other groups interested in agriculture or allied industries.

The principal subjects discussed at these meetings were: prices of farm products; adjusting farming to meet present and probable future price conditions; how to study the financial statements of cooperative associations; some principles of successful cooperation; factors affecting the demand and supply of milk in the New York milk shed; marketing New York farm products; factors for success in general farming; how to take a farm inventory and make a credit statement; farm credit; how to keep a dairy account; how to keep a farm cash account and figure labor income; the use of motor trucks and tractors on New York farms; farm building arrangement; farm taxes; how to use crop and market reports; factors influencing the cost of marketing potatoes; city demand for fruits and vegetables; the apple situation in New York State.

Of the subjects discussed the greatest interest was shown by the farmers in: factors affecting the demand and supply of milk in the New York milk shed; prices of farm products; adjusting farming to meet present and probable future price conditions; the apple situation in New York State; farm credit.

Members of this department held 28 conferences with officers or committeemen of local farm bureaus, agricultural teachers, officers and members of marketing associations, representatives of state and country bankers' associations, and other agricultural organizations. This is in addition to large numbers of conferences held at Ithaca.

The present enrollment in correspondence courses is 149; it has averaged 122 during the year. The following courses are now being offered:

Farm Management I. An elementary course in farm management, consisting of fifteen lessons which cover some of the basic principles of the subject.

Farm Management II. Advanced farm management (prerequisite course I). A course of fifteen lessons on farm organization, covering the major factors underlying the successful organization and operation of farm businesses.

Farm Management III. (Prerequisite, courses I and II.) A course of fifteen lessons, in which detailed studies of some successful farm businesses are made.

Marketing I. Cooperative Marketing. A course of fifteen lessons.

Farm Management IV. Farm accounting. A course of twelve lessons on farm inventories, farm cash accounts, crop accounts, dairy accounts, poultry accounts, labor accounts, and complete sets of farm accounts.

Farm Management V. Agricultural prices. A course of ten lessons consisting of an intensive study of agricultural prices.

The special farm-management service was extended to twenty-six farmers during the year. This service consists of the following: extension specialists from the department take a labor-income record of the farm business, make a map of the farm showing field lines and acreages and furnish the farmer with blueprint copies, make a farm-management study and analysis of the farm business, and try to find ways of increasing the profitability of the farm. At the end of the year the extension specialist has a conference with the farmer, takes another labor-income record, discusses recommendations for possible changes in farm organization, layout, or building arrangement, and gives whatever assistance is desired in summarizing or starting farm accounts.

Farmers receiving this service pay part of the cost, and in addition are expected to become farm-management project leaders in their communities and in this way help to establish a good farm-management program in their counties.

During the summer of 1926, twenty farm-management tours were held. In so far as possible, in arranging tours, preference was given to counties in which tours had never been held.

Members of the resident research and teaching staff of the department have carried on a most excellent piece of extension work in the publication of *Farm Economics*. This publication, giving a monthly review of agricultural prices and conditions and results of recent research work in the field of agricultural economics, is now being sent to 3400 persons—farm bureau committeemen, agricultural teachers, country bankers, and other leaders in agricultural work.

In addition to marketing work conducted at extension schools previously referred to, considerable assistance has been rendered by members of the department to officers of a number of cooperative marketing associations. This work, which was always done at the request of the marketing associations, consisted in helping to plan and establish sound financial marketing policies.

The "Market Basket," which consists of a very brief monthly summary of crop and market conditions and such results of recent research work as may have a seasonal application, is written up each month and furnished to county agents for publication in their local Farm Bureau News. The "Market Basket" is not a publication, and is released in mimeographed form only to county agents and extension workers.

Six folding cabinet exhibits featuring the farm inventory and credit statement were lent to country banks for two-weeks periods for use in encouraging farmers to take inventories. Thirty-five banks requested the loan of such an exhibit.

The cooperative cost accounting has been conducted on the same basis as in former years, with the exception that more attention has been given to returning the results to the farmers. Accounts were closed on thirty-two farms. The material furnished by these accounts is of inestimable value as a basis for extension teaching.

The week of January 3 to 8, 1927, was designated as farm-inventory week, and during the months of December and January a special state-wide farm-inventory-and-credit-statement campaign was held. Excellent cooperation was given in this campaign by country bankers, agricultural high school teachers, and local farm bureaus. Local farm bureaus devoted one issue of their monthly organs to the farm inventory and supplied local papers with news articles and stories. Posters, radio talks, and exhibits were extensively used during the months previous to "farm-inventory week."

In December, 1926, personal letters were written to officers of all banks in the State that had last year used the farm-inventory-and-credit-statement blanks prepared by this department. In these letters reference was made to the previous use of farm-inventory-and-credit statements by the banks, and attention was called to the availability of inventory blanks at the College or the local farm bureaus. Sample copies of *How to Take a Farm Inventory and Make a Credit Statement* and *How to Keep a Cash Account on a Farm* were mailed to the banks at the same time that the personal letters were sent out. Similar circular letters and copies of the two account books were mailed to all other banks in the State that do business with farmers.

For several years a farmer's credit statement has been included in our farm-inventory book. While this statement was looked upon very favorably by the bankers in the State, it was not an official credit statement of any banking institution or bankers' organization. The Federal Reserve Bank of New York had also prepared a farmer's credit statement, but it had not come into general use by country banks. At the request of the Agricultural Committee of the New York State Bankers' Association, representatives of this department met with that committee and the group agreed upon a special form of farmer's credit statement that is now the official credit statement approved by both the College and the State Bankers' Association. This credit statement was later approved by the Federal Reserve Bank of New York, and will be furnished by that institution to all member banks.

The Agricultural Committee of the New York State Bankers' Association has given most excellent cooperation to the department in its extension work. The committee has offered its cooperation on a farm-account project with farm boys which will be taken up next fall and winter in cooperation with the junior-project workers in several counties.

The farm-business service which is now being offered to four farmers in each county consists of special assistance to farmers in studying their farm businesses. The farmer pays a fee of \$2 to cover cost of record books, postage, and so forth, and takes his own inventory and keeps a cash account. The College summarizes his inventory and cash-account book, and at the end of the year makes recommendations for improving the farm business.

In discussing, at farmers' meetings, the results of research on factors affecting profits in farming, the most frequent question asked is, "Have you any figures from this county or community?" For three years this department experimented with community labor-income surveys as a basis for planning extension schools and community programs, before incorporating this type of work in its regular program. During the year five extension schools were preceded by community surveys, and the excellent results at these extension schools have proved the value of this type of work; and during the coming year an attempt will be made to precede every extension school by a community survey. Such a community survey is not research but is extension work. Its purpose is not to furnish material to be published in a bulletin. The work is done to obtain specific information to be immediately used as a supplement to the results of research work, and its purpose is to help the farmers in the particular community concerned to make more money.

For several years a group of farmers in Genesee County were very anxious to organize a farm-account service. At the request of this group a representative of the department met with the Farm Management Committee of the Genesee County Farm Bureau, and plans were made for a farm-account service. The Genesee County Farm Bureau agreed to enroll 50 farmers who would pay \$18 a year toward hiring a full-time farm-management specialist to keep their financial records and also to act as an advisor on farm-management problems. The office of the State Leader of County Agricultural Agents and this department appropriated \$1500 toward financing the service. This made possible the hiring of a full-time specialist to handle the service, and Professor I. F. Hall, who was on vacation from this department, was engaged to start the service on March 1,

1927, and to handle it for the six months following. On October 1, 1927, another specialist will be hired to take over the service, but he will be under the supervision of Professor Hall. The following, concerning the service, is quoted from correspondence with Professor Hall:

“Fifty-six farmers are now enrolled in this project, which was started on March 1. A representative from the College has charge of the work and visits each farmer once a month. The first month was spent in taking detailed inventories of all farm property. On each visit since then, the college representative has posted all receipts and expenses to the enterprise concerned. More than fifty of these men are keeping complete records of all labor done each day. These records are also posted to the account concerned. There is great interest on the part of the farmers in this project, and many others wish to enroll if more can be handled. The Genesee County Farm Bureau puts this project at the top of all projects accomplished in the county.”

Agronomy

Extension work conducted by a specialist in soils started in 1912 in the former Department of Soil Technology. Ever since the inception of the soils extension work, much attention has been given to the lime question. This is because three-fourths of the soils of New York need application of liming materials for the best production of crops and the preservation of soil productivity. Since 1920 the tonnage of lime used in New York farms has been increasing slowly but steadily as is shown by the following figures:

Year	Tons of liming materials used
1921	136,000
1922	150,000
1923	157,000
1924	159,000
1925	160,000
1926	170,000

Mixer fertilizers and separate materials such as acid phosphate and muriate of potash are being used in the State at the rate of about 375,000 tons a year. The extension service advocates that acid phosphate rather than low-grade mixed goods be purchased on dairy farms, and that in cases where mixed goods may be profitable high-analysis goods be used. A survey made in Orleans County in 1926 shows that progress in this direction is being made. In that county, out of a total fertilizer consumption of 7465 tons 14.8 per cent consisted of acid phosphate and 23.4 per cent consisted of fertilizer materials of high grade, including acid phosphate. In the State at large the low-grade formulas such as 1-8-1 and 2-8-2 are having a smaller sale than formerly, and the high-grade formulas such as 5-10-5 and 4-12-4 are rapidly coming into favor.

Extension work by a field-crops specialist was begun in November, 1914, and at that time constituted a part of the work of the Department of Farm Crops. For the first few years the greater part of the effort was devoted to teaching, in winter extension schools, methods of growing alfalfa, clover,

meadow grasses, and silage corn, and methods of pasture improvement and management. Gradually, as farm bureaus were established, various field demonstrations were attempted.

The early demonstrations were directed toward showing farmers the superiority of variegated alfalfa varieties as compared with common alfalfa for New York conditions. The force of those teachings has continued, with some later supplementing, down to the present time, with the result that competent estimates show that 75 per cent or more of the alfalfa seed now planted in New York is of one or another of the variegated varieties. Thus one of the common causes of alfalfa failure, the use of unsuitable seed, has been largely removed.

Demonstrations and lectures setting forth the value of alfalfa have been important factors in increasing the acreage of that crop in New York from 35,352 acres in 1909 to 119,867 acres in 1919. Campaigns in eleven counties during the past three years have been largely instrumental in increasing the alfalfa acreage to 198,031 acres in 1924 and to an estimated acreage of 240,000 acres at the close of the season of 1926.

When extension work with crops was first undertaken, the commonest practice was to use very large, late varieties of corn for silage. Lectures, demonstrations, and general publicity showed farmers that such silage has comparatively little feeding value. By 1917 and 1918, when the extension service had much to do in locating seed corn because of its scarcity, the desire of farmers was to obtain earlier varieties. Today the varieties most used are the medium-season ones such as Luce's Favorite, West Branch Sweepstakes, and early dents such as Cornell 11 and Golden Glow. This change results in silage of greater feeding value per ton, and in the production of increased amounts of digestible material per acre.

In 1921 the extension work in field crops and soils was merged in the Department of Agronomy, thus bringing two closely related lines of endeavor into a unified whole.

Effective teaching has been done in recent months in assisting New York dairymen to increase and stabilize milk production as a means for holding the fluid-milk markets of the State. The key to the most economical production of milk is the possession by the farmer of an abundance of protein in the form of roughage.

Educational progress is demonstrated by the results of the alfalfa campaigns carried on in eight counties during the past two years. In these counties, 10,500 acres of alfalfa have been seeded during the year 1926-27 as a result of definite advice and suggestion following personal visits to farms by agronomy extension specialists, and this is making a significant impression on the farming of the State. As the work continues during the next few years it should give the proper direction to some of the great changes that New York agriculture is facing in the immediate future.

Animal Husbandry

Among the significant contributions of the Department of Animal Husbandry to the agriculture of the State may be mentioned, first, the concentration of extension activities upon the increased production of the dairy cow through breeding and feeding. Lectures and talks before institutes and other farmers' meetings for the past thirty-five years have been largely

directed along this line, and when it is recalled that during this period the average production of the dairy cow in the State has risen from about 3000 to about 5500 pounds of milk yearly, it may reasonably be assumed that these efforts have at least been a factor in bringing about this result.

When, about thirty years ago, the associations of breeders of purebred cattle sought disinterested supervision of the records of their animals, this department was one of the first in all the States to undertake this work, and since 1894 the supervision of advanced-registry records has been a very important part of its extension activities. The results are too well known to need more than mention. Suffice it to say that during this time several hundred breeders throughout the State have found it worth while to pay several hundred thousand dollars for this work. The establishment, encouragement, and supervision of dairy-improvement associations among breeders of grade cattle has also been an important feature of the extension teaching of this department, and this, too, has given abundant results and at the present time the work is being rapidly increased.

The manufacture and sale of proprietary mixed dairy feeds has increased very rapidly in recent years. When first introduced, many of these feeds were open to serious objection because of the tendency to use inferior and worthless ingredients. This condition has been greatly improved, partly through legislation but more particularly through the advocacy of the "open formula"—which, it is believed, was first advocated by this department. Present indications are that in the not distant future the open formula will be the common one for all proprietary mixed feeds. For several years this department has furnished regularly each month a feed-ration service recommending the most economical combination of feeds at current local prices. This service has been greatly appreciated by the farmers of the State and has undoubtedly had great effect in bringing about better and more economical feeding practices.

For the past several years, the regular extension work in animal husbandry has been carried on by six full-time specialists. An extra part-time employee is engaged during three winter months to handle farmers' institute engagements; also, during the period when county fairs make heavy demands for judges, resident instructors are drafted for service. The division of the work remains as previously reported: dairy production, two specialists; dairy-improvement associations and cow-culling clubs, one specialist; sheep and wool production, one specialist; livestock sanitation, one specialist; club work, one specialist.

As in past years, a close cooperation has been maintained with the New York State Veterinary College. This has made it possible to secure needed service in several communities that have suffered losses from hog cholera and from so-called "stiff lambs." On several occasions veterinary specialists have made farm visits with the animal-husbandry specialists in order to better advise livestock owners as to the practices that should be followed. With the exception of a few isolated outbreaks of hog cholera and the usual losses of lambs, there have been no serious disease problems to deal with. In most of the dairy counties educational meetings have been held to support and advance the accredited herd work.

The livestock program for New York is well stabilized as regards the essential and more or less permanent lines of work. During the past year

attention has been given to the following subprojects: A, Reducing feed cost of production; B, Better breeding stock for the farm; C, Dairy-improvement associations and clubs; D, Production of wool and meat; E, Livestock health and development; F, Junior livestock club work.

To meet the demands for more market milk at the season of short supply, special milk-production meetings were held in July and August, 1926, and again in June, 1927. At these meetings, a marketing specialist discussed the market situation while the animal-husbandry specialist gave suggestions as to how production could be controlled by feeding and care.

A considerable increase is shown in the number of demonstrations, lectures, and farm visits. The number of teaching contacts is larger than previously reported for this group. This has resulted in part from the large attendance at the various dynamometer pulling contests and the increased demands for junior club work. The increase in lectures and farm visits is a distinct teaching gain.

The monthly ration service prepared each month for the farm-bureau papers is being sent out as in the past. This is known as the extension feed service. To reach persons who may not receive the farm-bureau monthly paper, a special letter is prepared and sent to large lists of dairy-men in the various counties. During the past year this letter has been designated the "Full Milk Pail." It affords an opportunity to discuss in a personal way timely topics, feed prices, and suitable feed mixtures to be used.

More recently two other service sheets have been put out by the department. One, known as the "Sheep Fold," is designed to bring the flock owners seasonal information on handling the flock. The other, called "Swine Facts," serves swine owners in essentially the same manner. Having these different service sheets to send to classified lists of livestock owners in the various counties makes it possible to supply information of current interest as well as to meet emergencies should they arise. The two latter service sheets are not sent at regular intervals.

Projects that have been carried to completion during the year are:

1. Steer-feeding demonstrations. While attracting a relatively small number of farmers in the State, interest in steer feeding seems to be on the increase. During the past winter, in the counties of Orleans, Erie, Genesee, and Wyoming, twelve cooperators fed 350 steers according to plans suggested by the animal-husbandry specialist and the county agent.

2. Perry lamb-feeding demonstration. In the vicinity of Perry the lamb feeders differ in their ideas as to the most economical and satisfactory methods of fattening western lambs. Some feel that the use of light feeds, made up mainly of oats, bran, and salvage grains and fed in a self feeder, give best results; while others believe that heavier fattening feeds, such as corn and barley, fed by hand, give better results. There is also a difference of opinion regarding the use of cull beans and silage. In order to compare these different methods under practical conditions, a demonstration was conducted on a farm near Perry with 200 lambs, these being divided into four lots of 50 lambs each. The object of the demonstration was to obtain as much profit as possible and as much gain as could be obtained in all lots, and still make a fair comparison of the various methods of feeding. The results of this demonstration have been published.

3. Ram sales. Two ram sales were promoted, to arouse interest in better breeding stock and to supply rams to breeders in their respective parts of the State. The sales were held in Albany and Yates Counties and were successful in every way.

4. State Fair exhibit. At the New York State Fair in September, 1926, a dairy-production exhibit was made with the object of increasing interest in keeping records of cows. Under the title "Get acquainted with your cows," the records of three high-producing cows were compared with seven dairy-improvement-association cows and ten average New York cows. The three high-record cows, as well as their feed and production records, were a part of the demonstration. The exhibit received wide publicity previous to the fair, and as a result many dairymen came directly to the exhibit to satisfy their curiosity as to the cows and their alleged production.

5. Dynamometer pulling contests. During the fair season, thirteen States and the Dominion of Canada cooperated in conducting horse and mule pulling demonstrations, and as a number of the States had two dynamometers there were nineteen machines employed in a total of 180 contests. The rules governing both classifications and conduct of these tests were uniform, so that results can be compared. These contests have attracted widespread interest, serving to center attention on the ability of horses to pull when properly driven, harnessed, and trained. The contests have seemed particularly worth while in increasing interest in good horses, good horse handling, and properly fitted harnesses.

6. Dairy-improvement associations. The growing interest of dairymen in record keeping is shown in part by the demand for milk sheets and herd-record books. The following were sent from this office:

	Year ending June 30, 1926	Year ending June 30, 1927
Milk-weight sheets	5,395	5,841
Herd-record books	1,354	1,658
Barn-record books	178	252

During the year 242 herd-record books were summarized and returned to the owners, and 4058 individual cow-record strips were filled out from the data in the herd-record books and forwarded to the Bureau of Dairy Industry in Washington. The number of dairy-improvement associations has increased from 31 on July 1, 1926, to 42 on June 30, 1927. This is the largest increase for any one year, and the present number of associations is the largest ever reported for New York. These 42 associations, located in twenty-six counties, include 1092 herds and 18,165 cows. In addition to the regular associations, many dairymen are keeping records through dairy-improvement clubs, notably in Oswego, Cayuga, and Ulster Counties. The increase in the number of dairy-improvement associations has naturally created a demand for more association testers. In order to fill the ranks and keep the service satisfactory, training schools for testers have been held at the College. One was held in October and another in January. The two-weeks school held in January, 1927, had an enrollment of 42; about 30 of these applied for places, and about one-third of them are handling associations at this time. The holding of district conferences with association testers was tried during the year and seemed much worth while.

7. Animal diseases. Preventable diseases still occasion a large and unnecessarily costly loss to farmers each year. The extension veterinarian spent more time in the field than last year, but the response to work of this sort comes slowly, and frequently only under the spur of necessity. The type of work emphasized in the winter meetings was control of tuberculosis, abortion, mastitis, and other udder troubles. The rearing of healthy calves, in view of demand for replacements, has been given some additional attention. In sections nearly free from tuberculosis, the more progressive dairymen are becoming receptive concerning measures to control abortion. A few breeders have been induced to keep systematic herd-health records.

During a part of April and May, 1927, four weeks were spent in continuing the work started the previous year with sheep growers to control losses from "stiff lambs." Although considerable progress has resulted, it is not yet possible to demonstrate methods which will completely control the trouble. It is therefore proposed to continue the effort another year. As in the past, this work has been carried on in close cooperation with the New York State Veterinary College.

8. Junior livestock extension. During the past two years the aggressive leadership of the junior livestock specialist has broadened interest in the work greatly. More clubs are being formed. These are met at intervals and receive instruction in feeding and management of livestock. They receive assistance in preparing demonstrations to be presented later at fairs or elsewhere. Members of the department instruct teams in judging livestock as a preparation for county or state fair contests. Through contacts made in this manner it has been possible to place many purebred breeding animals. Often the purchase of a purebred calf by a club member is the stimulus to start a better breeding program on that farm. Pig and lamb clubs are not so numerous but are none the less valuable. The activities in this project make up a substantial part of the total extension work of the department. During the season when fairs and contests are being held, several specialists of the department are required to carry the work.

9. Emergency milk-production meetings. During the month of June, 54 meetings were held with a total attendance of 3913. This gives an average attendance of 72 per meeting. In this series a marketing specialist and an animal-husbandry specialist were scheduled at each meeting. The latter presented a plan by which milk production could be kept at a higher level most economically. These special meetings were undertaken only after receiving assurance that a milk shortage during the fall and early winter months was threatened. The attendance of the leading dairymen in the several communities reflected a wholesome interest in holding the New York mill market and a willingness to learn the facts about production and marketing. The circumstances created a situation which made it easy to emphasize the necessity of using good methods to meet distant competition.

Botany

The extension activities of the Department of Botany have consisted this year, as heretofore, in the distribution of cultures for and information relating to the inoculation of the soil in preparation for leguminous crops, in answering letters regarding weeds and other plants, and in giving advice

in the field concerning weeds. During the past year the number of inoculation cultures distributed has been about the same as in the preceding years, namely, 20,000 cultures. Nearly 600 letters have been written concerning inoculation and some 500 letters dealing with weeds and plants.

Dairy Industry

Although the extension activities of the Department of Dairy Industry have been temporarily curtailed, owing to the absence for the year of the extension professor, a large amount of miscellaneous extension work has been done. A number of sanitary surveys of milk supplies have been made for cities in the State, and important help has been rendered in the improvement of milk supplies by working cooperatively with local health boards and municipal authorities. A junior project in the form of a "Care of Milk Club" for boys and girls has been initiated with encouraging results. Considerable work has been done also with the dairy manufacturing interests of the State in the introduction of improved methods. During the past decade New York has become mainly a market-milk-producing State, and the extension force of the department has been active in the improvement of milk supplies. In this work it has been possible to render service to the producers, the consumers, the shippers, and the distributors of milk. Active cooperation has been maintained with local health departments and municipal authorities.

Entomology and Limnology

The Department of Entomology attempts to benefit farmers in a practical way, through extended studies of the habits and methods of control of such injurious insect pests, under investigation now, as the following: (1) certain clover pests curtailing the production of clover seed, notably the clover-flower midge; (2) certain insects injurious to the apple, including the apple maggot and four species of leaf rollers; (3) cutworms injuring various crops, notably grapes, cabbage, potatoes, and different muck and garden crops; (4) insect pests of the woodlot and of shade trees, particularly the white-pine weevil, the pine-leaf scale, the maple bladder-gall, and the dogwood scale; (5) certain household pests, notably cockroaches and fleas, with particular reference to control with calcium cyanide; (6) greenhouse pests of all kinds, and insects injurious to ornamentals and to house plants.

As an illustration, the work with cutworms is of interest. These pests were abundant and injurious last year, and this year they have appeared literally by the hundreds in grape vineyards, in fields of cabbage, on muck areas, and in gardens, from one end of the State to the other. The department has had a man in the field at Penn Yan, working with the growers, giving advice and carrying on control measures, for several days at a time in the vineyards on Keuka Lake. This man has also spent some time on the muck lands at Elba, observing and fighting cutworms. Another specialist visited and advised cabbage growers at Preble, where cutworms have appeared in great abundance and have destroyed several areas of newly set cabbage plants. It was possible, through the use of poison baits, to kill thousands of the pests and to save several acres of plants in an adjoining field.

The spray-information service, which is conducted jointly with the Department of Plant Pathology, continues to occupy a major part of the attention of the extension entomologists. This work is conducted through farm bureaus. The special field assistants, who are assistant county agents, devote all their time during the growing season to advising farmers on the control of insect pests and plant diseases by means of a series of circular letters, telephone relays, and personal visitation. Requests for special aid have come from counties where fruit and vegetables are grown on an extensive scale. By working through the field assistants and certain county agents, the department is able to keep in close touch with problems of between 7000 and 10,000 farmers. The continued and growing demand for this work seems to indicate its distinct value. In the following counties a special field assistant was employed during the growing season: Suffolk, Nassau, Orange, Dutchess, Ulster, Greene, Erie, Ontario, Wayne, Monroe, and Niagara. In Chautauqua, Onondaga, and Orleans Counties the county agent acted as special field assistant. During the past two years a special effort has been made to help county agents develop a spray-information service in counties where there is a demand for the work but where fruit- and vegetable-growing interests are not of sufficient importance to require the full-time services of a special field assistant. These counties include Wyoming, Genesee, Yates, Seneca, Oswego, Schuyler, Clinton, Albany, Saratoga, Rensselaer, Columbia, Westchester, Broome, and Rockland.

To insure the efficient operation of the spray-information service, much time is spent in training and supervising the field assistants and the county agents through training schools, conferences, correspondence, and visitation, and not infrequently by telephone. A news letter is issued weekly which consists of a summary of the weekly reports of field assistants and timely articles on pertinent problems; it serves to knit the organization together. From the nature of this work it is necessary to keep in constant touch with field conditions, so that practical advice on control measures will reach the growers in each locality at the time when they can use the advice to best advantage.

In addition to the spray-information service an extensive correspondence is conducted with individual growers throughout the State. Large numbers of specimens are received for identification from persons who seek advice on the control of them. During the winter, especially, training schools and other meetings are conducted, while special lectures are given throughout the year.

Last fall and winter considerable attention was given to the organization and conducting of an educational campaign against the European corn-borer, in which lectures, radio talks, motion pictures, and printed matter were extensively used. One general corn-borer leaflet had a circulation of 55,000. For a number of years some 175 to 200 representative wheat fields have been carefully examined annually for the Russian fly. These findings have enabled the College to advise wheat growers when to sow wheat to avoid injury from this pest.

Ornithology and mammalogy. The work in ornithology and mammalogy has been handled by a professor and an instructor on a part-time basis, their chief duties being resident instruction.

In addition to the giving of numerous bird lectures at schools, granges, and various wild-life conferences, many photographs were taken to add to the collection of lantern slides used in these meetings. Some additional motion picture film was made. To ascertain the status of the ring-necked pheasant, especially in the counties of the western part of the State, it became necessary to spend considerable time in the field to determine the extent of damage being done to crops by this bird. Many farmers had complained to their county agents that their losses from pheasants were severe and that they wished aid in obtaining permission to lessen this damage in same way. As a result of this field survey some relief may be given.

The work with rodents has consisted of some rat-control demonstrations, but this project has not been carried to the extent that it should be, owing to lack of time. Some effort was spent in trying to rid the campus of rats, and a plan was adopted for future work along this line. Experimental studies in the control of field mice and common moles are being undertaken. Additional data are being gathered to aid those who are undertaking fur farming with muskrats, foxes, and rabbits. Numerous bulletins and letters have been sent out in reply to inquiries regarding the raising or the control of the various birds and mammals. A Farmers' Week exhibit emphasizing methods for the control of rodents was prepared and shown in Roberts Hall.

Beekeeping. Special extension work for beekeepers in New York was begun in 1918 at the urgent demand of honey producers, and has continued steadily. Ever since the work was started, cooperation and harmony have existed between the apiary extension work and the bee-inspection service administered by the Department of Agriculture and Markets at Albany, and much has been accomplished in the control of bee diseases because of this cooperation. The position of extension specialist in beekeeping has had three incumbents, which has caused interruption and delay in accomplishing plans along certain lines. For about two years teaching efforts followed the more general lines of apiary visits, lectures, field meetings, general apiary-improvement demonstration meetings, and organization work. Since that time more attention has been given to special demonstration meetings in which definite methods of practice are taught. This has resulted in many definite changes in apiary practice by beekeepers throughout the State. It is now planned to go one step further in definite field teaching, by establishing demonstration apiaries in as many counties as the specialist can manage. The county agents and the beekeepers have expressed their heartiest cooperation in this new line of work, and two such apiaries have already been established, one in Broome County and one in Chemung County. The object in conducting the demonstration apiaries is to demonstrate definite seasonal practices throughout the year. The specialist will endeavor to visit each apiary as often as is necessary in order to be sure that right methods are applied at right times. It is expected that the visits will take place about once a month during the active season between May 1 and November 1. The demonstration apiaries will all be conducted in cooperation with the county agents, and in most cases in cooperation with a county beekeepers' association. Because of the many beekeeping problems, such as wintering, swarm control, disease control, requeening, and so forth, the demonstration apiary has splendid possibilities.

Floriculture and Ornamental Horticulture

During the year 1926-27, practically no field activities have been carried on by the Department of Floriculture and Ornamental Horticulture. The specialist has been engaged largely with bulletin and office work.

In the earlier days the primary aim of all subprojects conducted by this department dealt largely with the individual. Gradually that method has been replaced by group service. The application of the program as adapted to the group resulted in a tremendously increased number (though perhaps not so correctly developed) of individual property improvements. Better than this, however, is the increased number of well-landscaped school properties, grange halls, rural churches, village parks, and other similar centers of rural activity; all of which stand as silent but powerful stimulants of community and home pride, and as examples of good taste and cooperative endeavor.

This has been a great service and no one can measure the results. The eagerness with which the school children and the girls and boys of the junior clubs have seized this program hints at its ultimate effect. Undoubtedly the greatest service rendered is that to the girls and boys. With their eagerness to learn, their receptivity, their natural love for beautiful things (a quality with untold possibilities of development), and their whole-hearted enthusiasm, the work with this group should be expanded and developed. A more satisfying rural environment and life is certain to be the outcome following a few years of such a program. This is the direction for future development. This is the greatest need.

The consideration of this need must not dwarf the importance of the senior work, especially that which needs to be done in connection with the churches, rural cemeteries, county recreation areas, and other public and quasi-public projects. Neither should the systematic program of roadside improvement be neglected, although this frequently follows the improvement of other specific community properties.

Another important aspect of the work which has only begun to develop is the stimulation of local improvement campaigns and contests. These, when conducted in the right manner, produce wonderful results which frequently extend beyond the borders of the local community involved in the campaign. These contests should have an important place in any well-developed extension program.

The immediate need of this department is for a development of subject matter in printed form that will meet the demands of the people. It was for this reason that the specialist was withdrawn from the field for one year in order to develop bulletin and pamphlet material.

Forestry

The Department of Forestry actively cooperates with the State Conservation Commission in its forest-planting campaign of recent years, more particularly by organizing this work in the counties, through cooperation with the county agents and the local farm bureaus. It has interested the local fish and game clubs in forestry. It has auspiciously begun a campaign for the better management of existing farm woodlands, a matter

quite as important as the planting of open nonagricultural land with forest trees. And it has secured the active participation in forestry of a number of the counties of the State. In this last-named project the establishment by Chautauqua County of the position of county forester, in April, 1927, is especially to be noted. This is the first post of this particular type to be created in the United States. Its first incumbent is a Cornell forester.

Another major line of extension work which has loomed large in 1927 and which is bound to increase rapidly in the future, is forestry as a part of junior-project work through the 4-H clubs. During the past year there have been 500 enrollments in twenty counties, with individual groups of from 10 to 100 boys and girls in each.

The conducting of forestry tours of county agents, farm-bureau officers, and others, to local points of forest interest, is a further extension development in which New York holds a leading place.

At Farmers' Week and at the State Fair at Syracuse the forestry exhibits of recent years have helped not a little to establish new contacts and to interest and really inform the people of the State as to the meaning and methods of forestry work.

Plant Breeding

The extension work of the Department of Plant Breeding comes into active relationship with that of a number of other departments. The most important of these contacts are the following: (1) formal cooperation with the Department of Agronomy in testing oat, barley, and field mixtures, and informal cooperation in the determination of adapted varieties and the discussion of variety problems; (2) informal cooperation with the Department of Plant Pathology in the treatment of seed for stock certified-seed sources and in the rogueing of hill-unit selection plots of potatoes; (3) informal cooperation with the State Seed Laboratory at Geneva in the examination of seed samples; (4) informal cooperation with the Department of Vegetable Gardening in the testing of cabbage and potato varieties.

Fundamentally, the aim of extension work in plant breeding has been to create an appreciation of hereditary values in crop plants. Historically, the spread of this knowledge is a late development. Heredity markedly conditions the biological response of economic plants to their particular environment, and the production of new and better varieties by breeding necessarily precedes demonstration teaching.

Teaching in methods of plant breeding is for the most part limited to formal classroom teaching and is only incidental to extension. The latter attempts to teach the actual value of better strains or varieties, and to extend their production and widen their use among farmers.

The College through its experimental staff has produced one or more new and better varieties of corn, wheat, oats, barley, rye, and beans, and the extension staff has endeavored to acquaint farmers with the superior merits of these and to further their adoption and use. More than sixty farmers are now growing seed of these strains as production centers for distribution. The growers are organized in a well-defined group, with

very definite standards as regards quality of product and under close inspection and supervision by members of the extension staff. This insures high quality of the material available for purchasers of seed, and an increase in quantity sufficient to meet increasing demand.

The potato-breeding project of the department is of significant value to the agriculture of the State. It has been possible, by means of selection methods, to isolate better-yielding and otherwise more desirable strains, and by propagating from them to produce stocks of potatoes markedly superior to the original stock. The policy of cooperating with growers of certified-seed potatoes insures that not only is the original cooperator benefited, but all who purchase seed stock from him also derive benefit from this cooperative effort between the farmer and the College.

The results of the department's study of the adaptability of red clovers from different sources have been of great value to our farmers in guarding against loss from winter injury from the use of seed produced in climates with much milder winters than ours. These studies had a prominent part in the agitation which resulted in federal legislation providing for the staining of imported clover and alfalfa seeds.

The methods of teaching farmers the value of seed is largely indirect. Much seed is sent to county agents, by whom it is used as demonstration material in the several counties. In some of the counties field demonstrations are held which are attended by representatives from the College. Probably the most effective work in securing the wider adoption and use of improved varieties has been the organization of the State Seed Improvement Association and the personal assistance given to its members. These men have been encouraged to advertise their product as seed recommended by the College and of superior merit. In addition, the department has by farm visits, by exhibits at fairs and elsewhere, and by lectures, seed lists, news articles, radio talks, and other means, assisted in distribution. The program has been successful to the extent that practically all the seed grown by these men, which passed the inspection requirements, has been sold and used as seed. This does not include, of course, the seed inspected through local farm bureaus and for local seed exhibits, much of which is sold and used as seed, or the large volume passing from farm to farm due to local recognition of its hereditary merits as a new and better variety.

At the best, only rough estimates of the extent to which the recommended varieties are used are obtainable. Partial surveys made last year indicate that, whereas only a few years ago many varieties of winter wheat were grown in the State, in 1927 more than 90 per cent of the wheat acreage observed in ten counties was confined to the three varieties recommended by the College. In several of the counties similar conditions obtain for oats and barley, and to a lesser extent with corn.

As part of the extension activity, regional field trials are conducted with the different kinds of crops, the results of which are used as a basis for extension teaching. This serves as a check, or measure, of the soundness of the recommendations, and affords opportunity for observing the performance of new varieties introduced. By their use a considerable degree of standardization in varieties recommended has been achieved. Using these data as a guide, elimination has proceeded year by year and only the best varieties retained. It is gratifying that with very few ex-

ceptions the recommendations of the College, when followed, have given highly satisfactory results to the farmers of the State.

The departmental extension work may be summed up as an endeavor to assist agriculture by providing our farmers with the highest-quality seed of the most suitable varieties, to teach them what good seed is, to assist them to form a correct conception of hereditary values in plants, to acquaint them with the merits of the best varieties, and to provide information as to where seed of these may be obtained.

Plant Pathology

The aim of the extension work in the Department of Plant Pathology is to provide the farmers of New York with information and service in respect to the practical control of the diseases of the crops which they grow. Various methods are used to accomplish this aim, such as publicity, correspondence, growers' meetings, demonstrations, and special types of service. As new methods of practical control are developed, the knowledge of them is extended to the growers, and when certain diseases become prevalent at any time special consideration is given to them.

Perhaps the most outstanding work is that known as the spray-information service, which is a joint project of the Departments of Plant Pathology and Entomology. This was started in 1917 as an emergency measure, but requests led to its continuance after the war, although the greater part of the cost of maintenance is now paid by the growers through their farm-bureau associations. The area covered by the service has steadily increased until now practically all fruit-growing regions of the State are provided with it. In each of the larger fruit-growing counties the spray service is administered by a special field assistant, appointed by the College, who devotes his entire time to the work from April to September, inclusive. In counties where fruit is of lesser importance the project is handled by the county agent directly.

The potato-disease-control work is also one of the important projects of accurate and timely information regarding the control of diseases and insect pests, not only of fruit but also of other crops. This is done for each spray or treatment to be made, by means of spray-information service letters, postal card warnings, and telephone calls that are relayed to growers. The cooperation of the Weather Bureau in providing special forecasts which are sent each night during April, May, and June to the various field assistants, is an important feature of the service. Much assistance is given also by the New York State Agricultural Experiment Station at Geneva. The farm bureaus are responsible for the organization and maintenance of the work in the counties, while technical supervision is vested in the Departments of Plant Pathology and Entomology. It is now estimated that approximately 15,000 spray rigs move into the orchards following the advice of these spray assistants.

The potato-disease-control work is also one of the important projects of the department. It has been a significant factor in increasing the average yield of the potato crop of the State during the past several years. Seed treatment with corrosive sublimate has become an established practice in potato-growing regions, except in Long Island, where the practicability of the method has not been proved. The practice of applying a fungicide

to the vines is increasing. The value of healthy seed has become well known throughout the State as a result of the certified-seed work promoted by this department since 1915. Field inspections made by the departmental staff have become the basis on which potato stocks are now certified for seed purposes. New York ranks first in the Union in potato production, and this disease-control work and good-seed work is of paramount importance to the industry.

Vegetable-disease-control work is being developed into a project which should in a few years rank in importance with the two preceding subjects. The vegetable industry of the State is very important. The growers are beginning to realize that the loss from diseases is a big factor in increasing their production costs. Recent investigations of diseases have made certain control measures available, and these are being demonstrated to growers as rapidly as possible. As further research results in the discovery of new and better measures, these will be presented to the growers. A promising aspect of the work is the eagerness with which the growers apply the control measures that are advised.

The extension program includes also control of diseases of cereals, ornamentals, and special crops such as tobacco and medicinal plants. There is an increasing demand for information about diseases of ornamentals, due to the increased production of such plants on a commercial scale. More work on cereal-disease control is needed and could be extended if more help were available.

Pomology

Extension work in the Department of Pomology this year has been carried on in all the subprojects listed under extension project No. 12, which constitutes our long-time program. These subprojects are as follows: pruning fruit trees; orchard-soil fertility; grafting fruit trees; thinning fruit; establishment and management of fruit plantations; grading and packing of fruit; fruit packing-houses; small fruits; grapes; home-fruit improvement. While all these subprojects received some attention, major emphasis was placed on thinning fruit to improve the quality, and better handling and packing methods.

The thinning demonstrations did not draw large crowds at the demonstration meetings, but, inasmuch as they have been used as object lessons on fruit tours and furnished valuable local results to present at meetings and schools, they were deemed satisfactory.

The outcome of the apple-packing demonstrations staged in the western New York fruit belt during a four-weeks period was highly gratifying. These demonstrations were conducted as a cooperative arrangement between the New York State College of Agriculture, the New York Central Railroad, and the Merchants' Dispatch, Inc., and consisted of one-day meetings at places along the New York Central lines. At those meetings attention was focused on the handling of the fruit crop from the tree to the market. The morning program was held at a local town hall, and included discussions on harvesting, handling, and shipping-point inspection of fruit. The afternoon session was held in four refrigerator cars and a day coach which contained the packages, fruit, and packing equipment, necessary for the demonstrations. The very latest packing devices were represented and were seen in operation. Various new types of packages

were used also. Proper methods of loading a car for shipment under refrigeration, ventilation, or heater-protector service, were explained and demonstrated; also, proper methods of making out bills of lading for special services rendered on refrigerator freight.

The morning lectures were well attended, and particular interest was expressed in packing-house management, market packs for fruit, and problems in fruit transportation. The demonstrations held at the cars in the afternoon drew large crowds. The interest centered around various methods of barrel packs, types of bushel packs, the standard refrigerator car, the proper loading of barrels and baskets, and the bracing of the load in the car.

In spite of the rather severe and inclement weather that prevailed during most of the month, the attendance averaged about 1000 a week. The growers have expressed a keen interest in this movement for better packing and transportation, and it is felt that the meetings have been well worth while.

Considerable time during December, January, February, and March was devoted to conferences and meetings with committees of fruit growers to study the facts relative to the fruit situation. The movement was the outgrowth of the depressed condition of the fruit business, and can be designated as one of the most significant movements in the history of the fruit industry in New York.

Through a resolution passed at the annual meeting of the State Farm Bureau Federation, and from many other sources in the State, had come suggestions that a conference of the leading fruit growers, college workers, and others be called to define and study the apple situation. It was recognized that many of the present causes of the economic conditions could not be changed. But it was thought that some of the present problems could be solved by coordinated effort on the part of fruit growers. A series of conferences between college specialists and leading fruit growers was held, where the facts were presented in concrete form by college specialists and committees appointed to make recommendations.

A vigorous program of publicity was conducted in connection with the effort to improve the apple situation. This included articles for the press, illustrated articles in the *Farm Bureau News*, special service letters to fruit growers, and timely mimeographed material to county agents. The special illustrated feature articles for the press had a very wide circulation. These were news stories about the apple and were designed with the view of increasing apple consumption. They were carried by the leading daily papers in the State, used in the photogravure sections and as editorials.

The conferences and meetings were on the whole unusually well attended and growers are displaying good interest. While no striking developments have yet resulted from these conferences, yet their educational effect can already be observed. Growers realize more fully the seriousness of the situation and are preparing to meet it. More unprofitable orchards, filler trees, and poor varieties are being cut out than in many years. Steps have been taken to improve the apple-grading law and to tighten up on inspection. Growers are therefore aroused over the situation and things are in a healthier condition than they have been for the past three years. The outlook for educational work in pomology is excellent.

A successful exhibit was staged at the State Fair. The theme was "Lessons in fruit growing," and practical suggestions were conveyed by means of enlarged photographs and living material. A total of 25,000 persons actually stopped and examined the exhibit.

Poultry Husbandry

The development of the poultry-improvement program in New York is the most important contribution which the Department of Poultry Husbandry has made through its extension activities. Its value cannot be estimated in dollars, but its results are conspicuously apparent on all sides. The more important steps in this program are as follows:

1. Culling demonstrations throughout the State during the summer months. At these demonstrations the poultrymen present are shown how to distinguish the layers from the birds out of production, and the good producers from the poor producers. They are taught also the importance of proper feeding and management and its relation to culling work.

2. Paid culling. This work is done by the county farm bureaus, which employ persons who have satisfactorily completed the most recent Cornell judging-school course to cull farm flocks during the summer months. The paid culling work is very popular and has increased rapidly during the past few years, now involving 34 counties and 1463 farms, and handling 254,000 birds in a single year.

3. Certification of poultry. It is now nine years since the New York State plan for official poultry certification was undertaken. During this time more than 279,000 fowls, including males and females, have been carefully selected for breeding purposes and shank-banded with official sealed certification bands by Cornell extension specialists. It is conservatively estimated that these New York State certified hens mated to New York State certified males will have produced up to June, 1927, more than 4,000,000 chicks. In addition to this the certified males which have been or will be mated to uncertified females probably will have produced, up to June, 1927, at least as many chickens as will the all-certified breeders, making a total of more than 8,000,000 chicks having the direct inheritance of one or more New York State certified parents. Even more striking than the large number of birds directly involved in the New York State certified breeding flocks, is the improvement seen in succeeding generations in the quality of the offspring from New York State certified birds, as measured by the size and vigor of the birds, their increase in egg production, the size of their eggs, and their freedom from important breed defects.

4. New York State official home record of performance. Several of the members of the New York State Poultry Certification Association are cooperating with the New York State College of Agriculture in the Home Record of Performance project, by which the twelve-months trap-nest records of specially selected, most promising pullets are officially supervised, and in the second year the eggs from the certified hens laying 200 eggs or more (weighing 2 ounces or more and of correct shape and correct color) are officially pedigree-hatched under official supervision of the Department of Poultry Husbandry of the College.

5. The New York State advanced-registry official record of performance. For fifteen years many members of the New York State Poultry Certification Association have availed themselves of the privilege of having a few of their choicest New York certified hens trap-nested and pedigree-bred, the eggs pedigree-hatched, and the chicks wing-banded, under state supervision by this department. The hens laying 180 eggs or more in the second or later laying years are recorded by and receive a certificate of performance from the International Record of Performance Association. There are now 650 in the project. About 1300 pedigreed chicks were hatched and banded for the owners.

6. Distribution of Cornell pedigreed cockerels. These cockerels are reared on the college poultry farm and are examined in the fall by members of the departmental staff. They are birds which would pass the rigid examination for certification in the field. In addition they are pedigree-hatched and are birds with good production records in their ancestry. About 100 superior male birds were distributed to approximately 75 persons.

7. Distribution of Cornell high-line pedigreed chicks. The chicks are from birds which have laid 170 eggs or more in one year on the female side, and from males whose dams have laid 200 eggs or more. These chicks are sold at a reasonable price in limited numbers to persons in the State. About 2000 chicks are thus placed most advantageously with about 45 persons annually.

8. The New York State production poultry show, conducted annually in November. This represents about 100 exhibitors and 1200 birds, and the estimated attendance is 300.

9. The Cornell poultry-judging school. This is to train persons in judging poultry for egg production and meat production. The attendance runs about 100 annually, with a total attendance in ten years of 816.

One of the most important factors in successful poultry farming, and one of the most essential steps to be taken in placing an unsuccessful enterprise on a sound profit-making basis, is the keeping of cost-account records. Since 1918, when the department started the project for keeping records on the farms of a cooperator, 182 complete sets of records have been obtained and summarized. Each year about 25 or more records are sufficiently accurate for tabulation and to be made available to all of the cooperators. In a single year, as many as 275 poultry cost-record books were sold to cooperators at cost, and as many as 3050 blueprint plans of poultry buildings designed by the department for use in the State were sold at cost. This work is done in cooperation with the United States Department of Agriculture.

An annual state-wide tour of poultrymen of the State to visit the College was first organized in 1926. This project, which is handled co-operatively by the county poultry councils, the county agricultural and home demonstration agents, and the staff of this department, results in bringing to the College for one day from 400 to 650 persons, who learn by observation and demonstration the work which the College is doing in all of its various phases. Last year visitors from 34 counties in New York State and from four other States participated in the tour.

Rural Education

In 1896, following a number of meetings of committees concerned with agricultural education in the public rural schools, \$8000 was given to Cornell for the purpose of carrying extension work, part of which should be the teaching of nature study in the rural schools of the State. Leadership in this nature work fell to Liberty Hyde Bailey, Anna Botsford Comstock, and John Spencer. Their experiences with the rural-school situation indicated the necessity of providing help to rural schools in at least three ways: (1) by the preparation of prospective teachers; (2) by the assistance to teachers in service; (3) by the provision of printed helps and guides for use by teachers and pupils of the schools. The work in nature study and science education has continued to develop along the lines of satisfying these fields of service. Courses have been and are offered which are designed to help prospective teachers and supervisors of nature work and high-school science.

Services in the form of teachers' meetings have been and are held to help teachers in service, and concerted action has developed within the past year designed particularly to help the teachers of the training classes for rural teachers and normal-school teachers. This has been made most effective by the cooperation of the State Department of Education. The program carried on in the Cornell Rural School Leaflet has had the approval of the State Department of Education and has been produced by the combined efforts of the various departments of rural education. During recent years it has appeared as a quarterly periodical, one number being devoted to the use of teachers and three to the use of children. The children's numbers have appeared in editions of 150,000.

Including the cost of printing, and salaries in this department, and excluding the cost of the mailing room, this program has been carried on roughly at the following expense to the State: for each 10 cents spent, each of the 150,000 patrons of the College has received three bulletins totaling 124 pages; in addition, the teachers of these patrons have received for each patron twenty pages of additional printed matter, and two minutes of resident instruction has been given to prospective teachers and two minutes of instruction to teachers in service.

It is difficult to measure the success of this work at present, aside from the demonstrated approval which the program has received from those for whom it was designed and the expressed desire of others for similar assistance. Whenever the support given has been lessened, there has been a distinct protest from those who have looked to it for help and guidance. The recognition of its value by other institutions might be taken as an index of the value of the work done, and the tendency of a few other States to begin to imitate the New York program might be taken as a sign of approval.

Significant contributions. The exchange of ideas between individuals in the rural schools induced by the assistance given them, and members of the university staff, has been most profitable in defining the type of assistance desired by rural school people. This is increasingly valuable because of the comparatively long period of time over which it has extended.

The work in nature study and high-school science has not concerned itself so much with the actual advancing of agricultural science as with the preparation of persons who may use successfully, and possibly themselves advance, agricultural science.

The direction of development in the future would seem to be that of the establishment of a closer relationship with the institutions concerned with teacher training, a recognition of the justice of the demands for assistance in this field from cities and communities larger than those now served, and a recognition of the demands for assistance from the various groups concerned with nature study, such as leaders of juvenile groups acting outside the school organization including the summer camp groups, the scout groups, and similar organizations.

Rural Engineering

The extension work of the Department of Rural Engineering is carried on under the following five main heads: drainage and reclamation; farm machinery and home machinery and equipment; water supply and sewage disposal; farm structures; junior project work.

The need for drainage presents itself on New York farms most commonly as wet spots in fields, which interfere with the effective use of labor-saving machinery; in other cases whole areas are late in drying out in the spring, and the crops are thus delayed so as to involve an economic loss; there are also large areas of very fertile low and swamp land which would be highly productive if brought under cultivation. The extension problem for the first two cases is to assist in providing demonstration areas which, by being drained, will become of greater value to their owners. Signs call attention to the fields and the neighboring farmers are stimulated by these practical examples. For the reclamation of low areas it usually happens that groups of farmers must be brought together to cooperate in constructing the required outlet. The extension problem here is to establish the engineering practicability of the undertaking, and then to assist and advise the groups in carrying out the work.

The extension problems as regards the more extensive and intelligent use of machinery in the home and on the farm are divided naturally into two parts — the selection of new equipment, and the use, care, and maintenance of equipment. Greatest emphasis has been placed on the phase of care and upkeep. The meetings take the form of schools lasting from one to five days. Schools on sewing-machine care and adjustment, or on single topics of shop skills, last only one day each; while schools at which tractors are brought in and overhauled take five days. Instruction is given on the care and sharpening of tools, including: saw filing; sewing and repairing harness; soldering; splicing ropes and tying knots; overhauling of small gas engines and of tractors and trucks. The overhauling and adjustment of sewing machines is proving to be intensely interesting to the farm women, and these schools are very popular.

In promoting water supply and sewage disposal on farms, general meetings of from one or two hours each are held and considerable personal service is given, the resulting installations serving as local demonstrations of great value.

As New York has a great dairy industry, good farm structures are of vital importance. Extension work in this field takes the form of study tours, in which groups proceed from farm to farm where they critically study the different features of structure and planning presented. Considerable personal service is given by drawings sent through the mail, conferences at the office, and personal visits in the field. The results of the research work on barn ventilation are actively carried to the farmers through these means. There is need and opportunity for much more work in this field than is now being offered.

Young people are naturally interested in manual activity, and the simpler phases of shop skills thus lend themselves admirably to the junior-project work. Question papers and practice exercises submitted by the students for credit are promptly graded and returned to them with suggestions for improvement. This work is highly successful, and is of great sociological importance as it interests the farm young people at the period of transition in their lives.

Rural Social Organization

Extension work in the Department of Rural Social Organization began with the appointment of an instructor in 1921. At first, considerable attention was given to developing community singing, and county training schools for recreational leadership were started. Since that time the extension staff has grown to include one professor and one instructor, and the demands in this field have increased very rapidly. The chief difficulty is to limit the work so that it will be of permanent constructive value, as it is impossible to meet all the requests for it. For the past year both members of the extension staff were in extension service only during the first semester, but in those five months their meetings were attended by 6,125 persons.

The larger part of the time of the extension workers has been given to training schools for local leaders in recreation and dramatics. During the past year, training schools were conducted in eleven counties with an attendance of 4905, and during the past four years thirty-eight of the counties of the State have been served with these schools and in some of them they have been repeated. These schools are conducted under the auspices of the farm and home bureaus, but they include representatives, not only of the local groups of those organizations, but also of granges, churches, schools, parent-teachers' associations, and clubs. As a result of the training schools in dramatics there has been a great increase in the number of dramatic productions by these rural organizations. As an example, a study of the year's program of forty-four granges was made from a random sample, and it was found that those granges had given a total of forty-seven plays during the year. The Little Country Theater was a regular feature at a dozen county fairs during the summer. As a result of the competition created at these fairs, intercounty dramatic competitions have been held during the past year, and for the coming year a state-wide dramatic contest has been organized in which fourteen counties are entered. These counties will compete in four districts, and the district winners will compete at the annual Farmers' Week at the College.

The department also encourages dramatics through the loan library, from which 1921 plays and 100 books were circulated during the year.

The two new phases of the extension work of the department during the past year have been (1) the increased amount of work with granges and (2) the large amount of time given to organization problems in local communities.

The correspondence with granges has probably doubled in the past year. Program material has been sent to grange lecturers regularly, particularly the outlines for debates prepared by the Department of Extension Teaching, for which there has been a lively demand. Granges have been especially invited to send representatives to the county training school. The third two-days conference for masters and lecturers was held during the annual Farmers' Week in February, and in April the first state-wide five-days school for grange lecturers was held with an attendance of 124. Both of these were organized with the active cooperation of the World Lecturer of the State Grange, to whom the success of the school, the first of its kind ever held, was particularly due.

The organization problems of local communities are varied. In general the contribution of the department has been to help communities to find out what they need and to help them get started. These projects vary greatly as the following list will indicate: getting a fire truck for a village; building a community house; equipping a school playground; starting a rural health clinic; arranging for regular monthly community meetings; equipping a parish house; beautifying the school and church grounds; arranging for week-day religious education in cooperation with the public schools in accordance with the permission of the state law; organizing a vacant church school; starting a loan library; planning a grange hall.

The training school for rural pastors was held during the summer school as heretofore. The need which is being met by this school is shown by the gradual increase in attendance in the three years during which it has been held, from 38 the first and 78 the second year, to 124 the past year.

A new feature of the year's work was the assistance given in organizing and conducting a week's training school for leaders of the various girls' and boys' organizations, held at the College in May. Forty-eight persons from all over the State were present, representing the 4-H club with the Camp Fire Girls, the Girl Scouts, and the Boy Scouts.

There is an increasing interest among the county leaders of junior extension work for a recreation program for their girls' and boys' clubs, and an experimental program for such work is being arranged in two counties for the coming year. It seems probable that this work may assume considerable proportions in the future.

The extension work of the department has demonstrated the importance of the social side of rural life as a feature of the extension service program, and its value for developing an esprit de corps both in individual groups and in rural communities as an essential basis of a permanent program of extension work. The research work of the department indicates that unless the social organization of rural communities is greatly strengthened, the countryside will be increasingly urbanized and will be more and more dominated by the cities with a probable deterioration of its social life. It is important, therefore, that we encourage a more serious consideration of the importance of maintaining a satisfactory community life for country people if we are to preserve a high standard of rural civilization.

Vegetable Gardening

Through extension teaching carried on by the Department of Vegetable Gardening, commercial vegetable growers have been kept informed on the results of research which give information of value from the practical point of view. Marked changes in practice have been made during the past few years as a result of this teaching. The chief contributions made by the department to this field have been the dissemination of information on the following subjects: the importance of good seed; better fertilizer practice; the need for more general use of green manures and cover crops to maintain the humus supply; the advantages of small crates for celery; standardization of packages; and economy in the production of vegetables. It is believed that hundreds of thousands of dollars have been saved during the past five years through the more intelligent buying of seed. As an illustration of this, growers of cauliflower in one region estimated that the use of a strain of seed located by this department added \$40,000 to the value of the product in one year in that region. Cabbage and celery growers have benefited still more through the use of better seed.

Celery growers estimate that the use of the small crate, recommended by the department as a result of research, adds 50 cents per crate to the value of the celery crop, and this would add at least \$400,000 to the value of the crop grown in New York each year. As a result of work done by the department and the New York State Vegetable Growers' Association, this crate is now the recognized and legal standard in this State.

The lettuce crate has been standardized so that only one size is now used, instead of three as in previous years. This reduces the cost of manufacture and eliminates confusion resulting from the use of three sizes. Similar efforts in standardizing the cauliflower crate are meeting with success. The New York State Vegetable Growers' Association, the State Department of Agriculture and Markets, and the Department of Vegetable Gardening, have cooperated in this work.

Marked improvements have been made in fertilizer practice during the past few years. For example, it was the practice formerly to use the same kind and the same quantity of fertilizer (1500 to 2000 pounds of 4-8-10) on celery, onions, and lettuce, grown on muck soil; whereas at the present time, 1 ton per acre of 4-8-10 is a common application for celery, 1000 to 1500 pounds of 0-10-10 or 2-8-10 for onions, and the equivalent of about 750 to 1000 pounds of 4-8-10 for lettuce. These changes have resulted in better crops at a considerably lower cost for fertilizer.

In general, it may be said that the teaching of the department is being followed by a large proportion of the best and most intelligent growers.

Growing vegetables for home consumption is the most universal phase of agriculture, and the one most intimately connected with the home. It is not only important on farms and in small towns, but it persists in large towns and in cities. It is the last rural interest to yield to urban conditions. The number of persons cultivating home gardens is very large, and no inconsiderable part of the activities of the department is devoted to their interests. Contact is made, by lectures, with some thousands of gardeners every year, and many more thousands are reached by bulletins and other literature. The increase in knowledge concerning the value of vegetables in the diet, and the spread of this knowledge, have resulted in a growing market demand and a stimulation of home garden-

ing. This has brought this department into close cooperation with the College of Home Economics. Our teaching reinforces that of the nutrition specialists by giving special attention to those vegetables which are most valuable in the diet, namely, the leafy vegetables and tomatoes, beans, peas, and carrots.

The teaching throughout the country undoubtedly has had a marked effect on the consumption of vegetables. In general it has been effective as is indicated by the great increase in production of vegetables during the past few years. The acreage of spinach grown in the United States more than doubled from 1918 to 1924, and that of green peas nearly doubled in the same time. For the years 1924 to 1926, the annual average export shipment of sixteen important fruits and vegetables increased 77 per cent over the average for the years from 1917 to 1919, whereas the population increased only 12 per cent during that period. The greatest increase in shipments of vegetables was for the perishable ones—lettuce 440 per cent, celery 188 per cent, and tomatoes 83 per cent.

Among the special features of extension work in 1926-27 the following are worthy of mention:

1. School for canners' field men. This school was held at Ithaca from March 1 to March 4, with an attendance of 50.

2. Vegetable machinery and equipment demonstration. This was held on August 4, in connection with the summer meeting of the New York State Vegetable Growers' Association. The attendance was approximately 300, and much interest was shown in labor-saving machinery and appliances.

3. Potato train. The department cooperated with the Erie Railroad and junior-club agents in several counties of western New York in staging a train exhibit as a part of the campaign to improve the quality of table-stock potatoes. Exhibits of typical specimens of standard varieties of potatoes were put up, and a member of the staff was present to explain the exhibit and to give demonstrations of cutting seed potatoes. Lectures and demonstrations were given also on judging potatoes. The attendance at the exhibits and demonstrations was about 1600.

4. Service letters. A new feature of the instruction of members of the 4-H garden, corn, and potato clubs is the service letter sent out monthly. Nearly 6000 members each receive a letter once each month calling attention to important things that should be done in that month.

5. Concentrated fertilizer demonstration. During the year the department cooperated with the United States Department of Agriculture in a demonstration of concentrated fertilizers in Steuben County.

6. Potato and vegetable exhibit. The department cooperated with the New York State Vegetable Growers' Association in staging an exhibit of potatoes and other vegetables at the annual meeting held in Buffalo. This was the first attempt at holding such a show, and it was so well received that it is likely to become an important annual event.

FINANCIAL SUMMARY

A statement of receipts and expenditures for the year covered by this report follows. A detailed statement covering the funds received from all sources is contained in the annual report of the Comptroller of Cornell University. That report may be obtained on application.

FINANCIAL STATEMENT, 1926-27

FUND	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1926	Receipts (college and Smith-Hughes) 1926-27	Expenditures 1926-27	Balance	
						Lapsed	Unexpended June 30, 1927
State	1925-26 Maintenance.....	\$1,350,146.00	\$ 108,569.83	(Refund)	\$ 91,140.75	\$17,595.74	
	1927 Deficiency—fuel, light, power, and water..	42,092.00	42,092.00	.....	42,090.54	1.46	
	1927 Reappropriation—printing.....	3,634.40	3,634.40	.....	2,355.97		\$ 1,278.43
	1926-27 Maintenance.....	1,358,068.00	1,358,068.00	.....	1,276,618.29		81,449.71
		\$2,753,940.40	\$1,512,364.23	\$166.66	\$1,412,205.55	\$17,597.20	\$82,728.14
Federal	Morrill and Nelson.....	\$20,000.00	\$ 20,000.00	.....	\$ 20,000.00		
	Hatch, Adams, and Purnell.....	43,746.20	43,746.20	.....	43,746.20		
	Smith-Lever.....	133,764.61	133,764.61	.....	132,947.92	\$816.69	
	Smith-Hughes.....		*(2,731.77)	\$22,899.34	21,521.06		*(1,353.49)
		\$197,510.81	\$194,779.04	\$22,899.34	\$218,215.18	\$816.69	*(1,353.49)
College	Tuition and fees }		\$62,770.36	{ \$ 57,825.54	\$243,381.74		\$56,949.45
	Sales and services }		10,000.00	{ 179,735.29	9,653.60	\$346.40	
	General Education Board.....	\$10,000.00		.....		
		\$10,000.00	\$72,770.36	\$237,560.83	\$253,035.34	\$346.40	\$56,949.45
			\$1,779,913.63	\$260,626.83	\$1,883,456.07	\$18,760.29	\$138,324.10

* Overdrafts on Smith-Hughes Fund covered by subsequent remittances from the State Department of Education.

CONCLUSION

In the preparation of this report, contributions have been made by the heads of the several departments and by many individual members of the staff. For aid in the organization of this material, as well as for independent contributions, special credit is due to the administrative officers in charge of the major divisions of activity, namely, Dr. Cornelius B. B. Director of Resident Instruction, Dr. R. W. Thatcher, Director of Experiment Stations, and Dr. Carl E. Ladd, Director of Extension. It is a pleasure to again acknowledge the always hearty cooperation of the officers of administration and of the members of the staff.

Opportunity must also be taken to express the very great obligation which the College and its administrative officers are under to you, Mr. President, and to the members of the University Board of Trustees, for the unfailing solicitude, counsel, and encouragement which have been given at all times and have added immeasurably to the satisfaction in the work. Special mention may be made of the State Commissioner of Education, Dr. Frank P. Graves, who, in addition to his duties as a trustee, has individually rendered innumerable services of great importance to the College.

When one looks back over these pages and grasps the vast range and character of the activities of the State College of Agriculture, and sees their significance for the State and the Nation, and especially for those engaged in agriculture in New York, he is conscious of the bounty of the State toward the College. Gratitude is due those in authority in the State Government who have made these things possible.

Respectfully submitted,

A. R. MANN,

*Dean, New York State College of Agriculture
and Cornell University Agricultural Experiment Station.*

INDEX

A	PAGE
gricultural Economics and Farm Management, extension work.....	124
gricultural Economics and Farm Management, history and general report.....	33
gricultural Economics and Farm Management, research.....	69
gricultural Economics and Farm Management, research publications.....	86
griculture in New York State.....	7
ronomy, extension work.....	128
ronomy, history and general report.....	35
ronomy, research	70
ronomy, research publications.....	88
merican Dry Milk Institute fellowship.....	16
imal Husbandry, extension work.....	129
imal Husbandry, history and general report.....	38
imal Husbandry, research.....	74
imal Husbandry, research publications.....	90
ropriations	14
not Forest	17
res, W. E., promotion.....	20
B	
lyne, T. L., jr., promotion.....	20
eekeeping, extension work.....	136
nzell, Cora E., resignation.....	19
otany, extension work.....	133
otany, history and general report.....	39
otany, research	74
otany, research publications.....	91
rownell, W. A., resignation.....	19
urkholder, W. H., promotion.....	20
C	
harles Lathrop Pack research professorship in forest soils.....	16
hupp, Charles, promotion.....	20
onley, Emma, continuation of appointment.....	19
ooperative projects	30
ost of maintaining State Colleges, per unit of products.....	11
ounty fairs	109
rosby, D. J., death of.....	21
urriculum, development of.....	28
urtis, O. F., exchange work at Leeds University, England.....	20
D	
Dairy Industry, extension work.....	134
Dairy Industry, history and general report.....	40
Dairy Industry, research.....	75
Dairy Industry, research publications.....	91
Dalton, L. A., resignation.....	19
Dean's report	7
Demonstration trains	110

E		PAGE
Education and labor income in farming.....	12	12
Entomology and Limnology, extension work.....	134	134
Entomology and Limnology, history and general report.....	42	42
Entomology and Limnology, research.....	73	73
Entomology and Limnology, research publications.....	95	95
Extension schools	107	107
Extension service	104	104
Extension specialists' field activities, summary of.....	112	112

F		
Faculty. <i>See</i> Staff.		
Fairs	109	109
Farm and home institutes.....	108	108
Farm bureaus	121	121
Farm products, value in 1920.....	18	18
Farmers' Week	111	111
Farrand, Livingston, letter of transmittal.....	5	5
Fellowships	10	10
Field Days, Junior.....	113	113
Financial summary	154	154
Finch, Pruyn & Co., camp for forestry.....	13	13
Floriculture and Ornamental Horticulture, extension work.....	15	15
Floriculture and Ornamental Horticulture, history and general report.....	44	44
Floriculture and Ornamental Horticulture, research.....	76	76
Floriculture and Ornamental Horticulture, research publications.....	98	98
Forest, Arnot	17	17
Forest soils, Charles Lathrop Pack research professorship in.....	16	16
Forestry, extension work.....	15	15
Forestry, history and general report.....	44	44
Forestry, research	76	76
Forestry camp, summer.....	18	18

G		
General Education Board, grant from.....	73	73
Grants	17	17
Graves, F. P., letter of transmittal.....	3	3

H		
Hart, V. B., promotion.....	20	20
Hartwig, H. B., appointment.....	20	20
Henrici, A. T., temporary appointment.....	20, 43	43

I		
Indian extension	110	110
Instruction at College, history and development.....	32	32

J		
Junior extension	123	123
Junior Field Days.....	113	113

K		
Kruse, P. J., appointment to departmental headship.....	14	14

L		
Labor income and education in farming.....	12	12
Long Island vegetable research farm.....	67, 84	84
Lord, C. S., letter of transmittal.....	3	3

INDEX

155

M

PAGE

McCay, Clive, appointment.....	20
Mammalogy, extension work.....	135
Mann, A. R., report.....	7
Meetings held at College.....	29
Meteorology, history and general report.....	49

N

Nafe, R. W., appointment.....	20
Nehrling, A. H., resignation.....	19
New York Cooperative Poultry Certification Association, grant from.....	16
News service	114

O

Ornithology, extension work.....	135
----------------------------------	-----

P

Pack research professorship in forest soils.....	16
Peabody, G. E., promotion.....	20
Pearsall, W. H., temporary service.....	20
Pizer, Charles, & Co. investigatorship.....	16
Plant Breeding, extension work.....	138
Plant Breeding, history and general report.....	49
Plant Breeding, research	77
Plant Breeding, research publications.....	98
Plant Pathology, extension work.....	140
Plant Pathology, history and general report.....	53
Plant Pathology, research	78
Plant Pathology, research publications.....	99
Pomology, extension work.....	141
Pomology, history and general report.....	57
Pomology, research	80
Pomology, research publications.....	101
Poultry Husbandry, extension work.....	143
Poultry Husbandry, history and general report.....	61
Poultry Husbandry, research	80
President's letter of transmittal.....	5
Publication, Office of.....	114
Publications, departmental	86
Publications, list of.....	118
Publications, summary of.....	121

R

Rahn, Otto, appointment.....	20, 43
Research activities	68
Reynolds, J. A., appointment.....	20
Rural Education, extension work.....	145
Rural Education, research publications.....	103
Rural Engineering, extension work.....	146
Rural Engineering, history and general report.....	61
Rural Social Organization, extension work.....	147
Rural Social Organization, history and general report.....	64
Rural Social Organization, research.....	81

S

Soil surveys	71
Staff, changes in.....	19
Staff of college.....	18
Stewart, R. M., appointment to directorship of summer school.....	19
Student body, history and statistics.....	21
Study courses	115

T

Thatcher, R. W., resignation.....	157
Trains, demonstration	158

V

Vegetable Gardening, extension work.....	159
Vegetable Gardening, history and general report.....	160
Vegetable Gardening, research	161
Vegetable Gardening, research publications.....	162

W

Williamson Cooperative Vegetable Growers' Association fellowship.....	163
Works, G. A., resignation.....	164

Y

Young, P. R., resignation.....	165
--------------------------------	-----

STATE OF NEW YORK

NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

FORTY-FIRST ANNUAL REPORT

1928

A. R. MANN, DEAN

**NEW YORK STATE COLLEGE OF AGRICULTURE
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION**

LIVINGSTON FARRAND,
President of the University

A. R. MANN,
Dean of the College

CORNELIUS BETTEN,
Director of Resident Instruction

F. B. MORRISON,
Director of Experiment Stations

C. E. LADD,
Director of Extension

Exchange
14 State Library
3/24/31

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

Albany, January 15, 1929

To the Governor and Legislature of the State of New York:

SIRS: Pursuant to law, the Forty-first Annual Report of the New York State College of Agriculture and of the Cornell University Agricultural Experiment Station is herewith submitted to the Legislature.

Very respectfully yours,

CHESTER S. LORD,

Chancellor of the University.

FRANK P. GRAVES,

President of the University and Commissioner of Education.

PRESIDENT'S LETTER OF TRANSMITTAL

September 10, 1928

The Governor of the State of New York,
Albany, New York.

The Commissioner of Education,
Albany, New York.

The Secretary of the Treasury, .
Washington, D. C.

The Secretary of Agriculture,
Washington, D. C.

The Act of Congress, approved March 2, 1887, establishing agricultural experiment stations in connection with the land-grant colleges, contains the following provision: "It shall be the duty of each of said stations, annually, on or before the first day of February, to make to the Governor of the State or Territory in which it is located, a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States."

The Act of the Legislature of the State of New York in 1926 accomplishing the reorganization of the State Government, provides that the New York State College of Agriculture at Cornell University shall make annual report of its general operations and expenditures to the Commissioner of Education.

In conformity with these laws I have the honor to submit herewith, on behalf of Cornell University, the report for the fiscal year 1927-28 of the New York State College of Agriculture and the Cornell University Agricultural Experiment Station.

It is the aim of the University to render the highest service which its funds and facilities permit to the industry of agriculture and to the body of farm dwellers on whom much of our state and national security rests. How well the University has accomplished its obligations during the past year is reflected in part by the records of service contained in this report from the Dean of the State College of Agriculture. No printed report can adequately portray the spirit of the work or the full significance of its accomplishments. Nevertheless, the activities and achievements of the year afford stimulating reading and great encouragement to those who follow the progress of knowledge and its utilization in agriculture and country living. The report is commended to the thoughtful attention of the people of the State, and to the officers of government in State and Nation.

Respectfully submitted,

LIVINGSTON FARRAND,

President of Cornell University.

REPORT OF THE NEW YORK STATE COLLEGE OF AGRICULTURE AND OF THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION FOR THE YEAR 1927-28

June 30, 1928

To the President of the University:

SIR: I have the honor to submit a report of the New York State College of Agriculture and of the Cornell University Agricultural Experiment Station, for the fiscal year 1927-28.

The changing agricultural situation

The most constant factor in agriculture is the constancy of change. This is no less true of the agriculture of the older States, such as New York, than of that of the newest farming regions. This fact is little realized by the generality of people, and farmers who experience the pressure of the attendant conditions and slowly effect the readjustments do not always sense the broader significance of the factors of change and whither they are tending. The agricultural institutions of the State, however, and the responsible authorities in government, must, in so far as may be possible, keep themselves informed of the factors and processes involved and what steps should be foreseen and taken, at appropriate times, to enable farmers to modify their plans and practices with a minimum of loss and a maximum of advantage for the future. This can be done only by the constant assembling, organizing, and interpreting of the factors involved, and by placing these findings before farmers with suggestions for economically sound modifications. As national and world situations are commonly the underlying reasons for changes in New York farming, the studies and the outlooks of the State's authorities must be exceedingly comprehensive and must touch every phase of agriculture to which New York is adapted.

The nature of the changing agricultural situation, with some of its current effects on New York, is briefly indicated in the paragraphs which follow, prepared by Dr. W. I. Myers, Professor of Farm Management in the Department of Agricultural Economics and Farm Management of the College.

The rapid growth of cities, the increased use of labor-saving farm machinery, and the improvement of transportation facilities, have resulted in a rapid change from a self-sufficient to a commercial agriculture. Paralleling this change, there has developed an increasingly minute geographical specialization of agricultural production. While these trends have been world-wide, the changes have been especially marked within the United States because of the absence of tariffs or other artificial barriers to trade between the States.

From 1845 to 1925 the number of sheep on farms in New York decreased from about 6,500,000 to less than 500,000. During the same period the number of dairy cows increased from about 1,000,000 to about 1,400,000. The change in the utilization of the milk produced has been as striking as the changes in the relative importance of sheep and cows. Whereas butter and cheese were the most important dairy products in 1845, a large and increasing proportion of the milk produced is now being used as fluid milk by the rapidly growing cities of the State.

Similar trends are evident in crop production. In 1924 the area of wheat in New York was only one-third of the area grown in 1844. Flax and turnips, important crops in 1845, have disappeared from New York farms. During the same period the production of potatoes, cabbage, lettuce, and other vegetables has increased greatly.

In 1925 the population of New York State constituted about one-tenth of the total population of the United States. The greatest agricultural opportunity for New York farmers lies in the production of those perishable and bulky products that are adapted to their climate and soil, and that are demanded in increasing amounts by the urban population.

Beef, wool, butter, wheat, and flax can all be produced on New York farms. However, New York farmers have the greatest advantage in products that cannot be economically shipped long distances. It is reasonable to expect a continuation of the tendency for bulky, perishable human foods to gradually displace the concentrated farm products that can be shipped economically from producing regions more remote from market.

From 1890 to 1920, the total number of bearing fruit trees (principally apples) in western New York increased 45 per cent, while the number in the Hudson Valley increased about 9 per cent. During this same period the number of bearing fruit trees in New York State outside of these regions decreased 45 per cent. This concentration of fruit production in the best-adapted regions illustrates both the nice adjustment attained in regional specialization and the tendency toward specialization of production by individual farmers. While extreme specialization is not likely to become common in agriculture, there is an increasing tendency toward a moderate degree of specialization—the production of a few products to which the region is best adapted. This trend is encouraged by the use of expensive special equipment for certain enterprises, and by the need for special skill and training in breeding, disease control, and nutrition.

For many years, market hay (principally timothy) was an important source of income for a large number of New York farmers. There were three principal outlets for this hay: horses in cities, eastern intensive-dairy farms, and southern cotton farms. In 1925 there were only 29 per cent as many horses in nineteen large cities as there were in 1910, and the number is still decreasing. In spite of a tariff of \$4 a ton, competition with Canadian hay for the eastern dairy-farm market is becoming increasingly keen. High freight rates are encouraging southern farmers to grow more of their own hay, and the Middle West offers keen competition to New York for supplying whatever deficiency exists.

There is no prospect of a satisfactory demand for the quantity of timothy hay now being produced for sale. The city demand has almost disappeared. The demand from eastern intensive-dairy farms promises to increase slowly, but it is for clover or alfalfa hay. In years of average or large crops, it is impossible to market the quantity of timothy hay now being produced at prices that will will pay a fair return to the producer.

In spite of the declining market demand for timothy hay and the consequent low prices, the acreage and production of hay in New York have shown only a slight decrease. In response to unfavorable prices, some farmers have decreased the production of timothy hay for sale while others have increased it. The shortage and the high price of labor have been important factors causing some farmers to decrease intensive crops and substitute extensive crops such as grain and hay. On farms that have been partly abandoned, hay is cut by the owner or by neighbors even after other crops have been discontinued.

Over a long period of time, farm practices become adapted to local conditions. However, when conditions change, desirable adjustments in practices are made slowly. This lag in adjustment is due partly to habit and partly to the fact that farmers are not sure as to the permanency of the changes.

Changes in market demand are reflected back to producers through prices. Since prices of all farm products are fluctuating continually, it is necessary for farmers to decide whether a given price change is temporary or permanent before deciding what changes, if any, are indicated in their farming operations. If the solution of such problems of farm adjustment is left to the natural operation of economic forces, a long period of hard times is inevitable whenever a major readjustment becomes necessary. Research and education in the biological and economic problems of agriculture can aid in hastening necessary adjustments and in reducing losses resulting therefrom.

One of the most important problems of New York agriculture at the present time is the readjustment of farming in the regions in which timothy hay was formerly an important sale crop. The low prices received for such hay in recent years have resulted in heavy losses and serious hardship. Furthermore, the change is not temporary and there is no prospect of satisfactory returns until production is reduced to a point commensurate with the decreased demand.

For example, for many years timothy hay has been an important source of income to the farmers of Seneca County, New York. Being faced with a serious problem of agricultural readjustment, this county has taken the lead in building a long-time program for the sound development of its agriculture. An agricultural conference committee was selected by the Seneca County Farm Bureau, representing all of the agricultural interests of the county — the Farm Bureau, the Grange, the Board of Supervisors, the bankers, and other interested groups. This committee visited the State College of Agriculture in order to obtain the results of all available research projects bearing on their problems. With the cooperation of the college specialists, the committee prepared a long-time program for the development of Seneca County agriculture. This program will form the

basis of educational work in agriculture to be carried on by the Farm Bureau and the Extension Service. If this program is carried forward in the same way in which it has been begun, it will be an important factor in speeding the necessary readjustments and in reducing losses.

Similar, although in most cases less serious, problems of agricultural readjustment exist in most of the important farming areas of New York. Nor is there any easy formula leading to the solution of these problems.

The changes in New York farming have enabled the State to maintain a very high place in the agriculture of the Nation. New York is one of the foremost agricultural States, and must be kept so in the interest of the vast population within its borders. At the last census, in 1925, New York ranked eighth among all the States in total value of farm crops, and sixth in the value of animal products, even though it ranked only twentieth in area of land in farms and twenty-ninth in total area, and contains only one-fortieth of the farm population of the United States.

The implications of this are very specific for the State College of Agriculture and the Agricultural Experiment Stations as the primary agencies maintained by the Commonwealth for the progress of agriculture by the fundamental means of research and education, by the expansion of knowledge, and by its fuller utilization in farm practice.

The need to strengthen the educational and research services: the financial implications

On page 11 is presented a summary of state and federal appropriations and other revenues available for the College during the year 1927-28, and a summary of expenditures. A fully itemized and detailed accounting of these receipts and disbursements appears in the annual report of the Comptroller of Cornell University, copies of which are freely available to the people of the State on application to that office.

The state appropriations made by the Legislature of 1928 for the current maintenance of the College for the ensuing fiscal year, and including an item of \$4230 for nursery work immediately available for 1927-28, totaled \$1607 net lower than for the year 1927-28. There were increases in personal service for new positions and salary advances in the amount of \$12,975, a grant of \$15,270 for new service to the nursery industry of the State in research and in the instruction of students, an increase in the appropriation for repairs in the amount of \$3000, an emergency repair item of \$5750 to restore the loggias of Roberts Hall, and an increase of \$60 in the item for rent. These increases were offset by a decrease of \$42,092 in the deficiency appropriation of 1927-28 for fuel, light, power, and water, and a further decrease of \$800 in the funds for the Long Island vegetable research farm.

The increases allowed were helpful and were fully appreciated by the institution. They were, however, wholly inadequate and left the College in a most difficult and thoroughly disturbing condition. There were no increases in the operating funds. The existing staff is seriously under-maintained and is deprived of many of the supplies, equipment, and other facilities necessary to its work. The productivity of several departments is greatly impaired because they do not have some of the apparatus and

FINANCIAL STATEMENT, 1927-28

Fund	Original appropriation	Expenditures previously reported	Amount available or unexpended July 1, 1927	Receipts (college and Smith-Hughes) 1927-28	Expenditures 1927-28	Balance	
						Lapsed	Unexpended June 30, 1928
State							
1926-27 Maintenance.....	\$1,358,068.00	\$1,276,618.29	\$ 81,449.71	.....	\$ 60,605.75	\$20,843.96	.....
1927 Reappropriation for printing.....	3,634.40	2,355.97	1,278.43	.....	1,278.43	.....	.....
1927-28 Maintenance.....	1,389,748.00	.....	1,389,748.00	.....	1,233,543.26	.....	\$156,204.74
1928 Deficiency (for repairs to loggias, Roberts Hall).....	5,750.00	.....	5,750.00	.....	1,943.67	.....	3,806.33
1928 Courses in nursery work.....	4,230.00	.....	4,230.00	.....	941.06	.....	3,288.94
	\$2,761,430.40	\$1,278,974.26	\$1,482,456.14	.....	\$1,298,312.17	\$20,843.96	\$163,300.01
Federal							
Morrill and Nelson.....	\$ 20,000.00	.....	\$ 20,000.00	.....	\$ 20,000.00	.....	.....
Hatch, Adams, and Purnell.....	52,722.90	.....	52,722.90	.....	52,722.90	.....	.....
Smith-Lever.....	133,462.68	.....	133,462.68	.....	132,301.29	\$1,161.39	.....
Smith-Hughes.....	.....	.....	*(1,353.49)	\$23,777.60	19,897.03	.....	\$2,527.08
	\$206,185.58	.....	\$204,832.09	\$23,777.60	\$224,921.22	\$1,161.39	\$2,527.08
College							
Tuition and fees }.....	.....	.....	\$56,949.45	{ \$ 62,670.61	\$255,882.57	.....	\$44,278.17
Sales and services }.....	.....	.....	10,000.00	{ 180,540.68	9,647.00	\$353.00	.....
General Education Board.....	\$10,000.00	.....	4,800.00	.....	4,436.35	.....	363.65
Laura Spelman Rockefeller Memorial.....	4,800.00	.....	5,000.00	.....	1,394.71	.....	3,605.29
Pack fund.....	5,000.00	.....	.....	.....	.....	.....	.....
Total.....	\$19,800.00	.....	\$76,749.45	\$243,211.29	\$271,360.63	\$353.00	\$48,247.11
Grand total.....	.....	.....	\$1,764,037.68	\$266,988.89	\$1,794,594.02	\$22,358.35	\$214,074.20

* Overdrafts on Smith-Hughes Fund covered by subsequent remittances from the State Department of Education.

materials which their work requires. The inadequacy of the funds for travel necessitated curtailment in both extension teaching and research through sheer inability of staff members to travel to the points where their work called them. The only sound economy for the State is to make it possible for those whom it engages to render the service for which they are engaged.

Quite as serious is the steady undermining of the College through the persistent withholding of salary increases for men and women of large and growing abilities, whose work adds many millions of dollars to the agricultural wealth of the State every year. The salary scale has not been adjusted in accordance with the cost of living since the war, nor has it kept par with the growing competition for qualified men in agricultural teaching and research. The situation is highly acute. The College has no power to protect itself against the demands of other institutions. It is equally embarrassed in filling vacancies. It is far more embarrassed in the deep sense of injustice to members of the staff who are rendering notable service in a spirit of devotion to the needs of the State and the training of young men and women for its responsible demands.

The work of the State College of Agriculture should be supported and developed on the basis of the needs of New York State in agriculture, with such additional provisions for the national requirements in agricultural research and the higher training of men therein as may appropriately fall to New York and as the State may properly aspire to make. New York has national preeminence in certain of its fields of public endeavor, and, since it is one of the leading agricultural States in the nation (ranking seventh), it should seek to maintain a foremost place in its educational and research service to agriculture and country life.

The State's service to agriculture through its State College could be accomplished most understandingly, efficiently, and economically if the State would adopt and consistently carry out a well-considered and adequate program of maintenance and development of the College with respect to housing, salaries, and general maintenance, and new undertakings. Such a program can be intelligently prepared by the cooperation of the State's fiscal and agricultural authorities, the State Department of Education, and the responsible trustees, officers, and staff of the State College and the University. The systematic upbuilding and maturing of the College over a period of years, directed toward well-considered goals worthy of the State's ambition and its agricultural interests, could thus be accomplished with confidence and with satisfaction to all who are concerned, and with justice to those immediately charged with performing this educational and research function of the State. While, by reason of restricted appropriations over a series of recent years, initial relief of more than ordinary amount is urgently required, in subsequent years the increments could be adjusted in such a way as to accomplish the realization of the program within a period of time reasonably determined. The State will have accomplished a notable service to one of its major fields of interest when it has placed the development and progress of this institution on a sound, continuing basis which looks toward the unfolding of a college of the highest rank, adequately housed and maintained, and with

a personnel compensated in a measure fairly commensurate with that of the leading college and university faculties of the land.

Needs with respect to the present organization. In a later part of this report dealing with the work of the several departments, mention is made in detail of many of the current items of need. There follows here, in summary form, a statement of the general requirements of the College which should receive careful consideration by the people of the State and by the responsible officers of government.

Compensation of the staff. The first consideration in a teaching and research institution is the character, the educational and scientific qualifications, and the spirit, or morale, of the staff. This is all-controlling. The product, or end-result, of the entire investment depends upon this. The staff of the New York State College of Agriculture has been painstakingly assembled over a period of years, and is representative of the training acquired in fifty or more institutions, thus bringing to New York the combined quality and experience of a great range of institutions in America and Europe. Inbreeding is one of the worst things that can happen to a higher institution of learning.

The abler the staff, the more insistent is the pressure exerted upon it by other institutions, by industry, and by other public services, to draw men from it — the best men, usually. The extent and severity of this pressure is not to be measured simply by a numerical record of losses; a very considerable part of the present teaching and scientific staff have had invitations to go elsewhere at higher salaries, sometimes nearly double their present salaries, but have remained partly because of unwillingness to interrupt important work they have under way here, and partly in confident hope that within a reasonably early period their compensation in New York would more nearly approximate the value which others have attached to their abilities and services. Long deferment of financial promotion harms an institution both within and without: within, by losses and by gradually crushing the spirit, or morale, which is a prime essential to the most efficient productivity; without, by making it difficult to attract able teachers and investigators — for the internal spirit and the recognition (or the lack of it) given to growing ability soon become common knowledge.

The salary scale in the New York State College of Agriculture is not to be judged simply by the salary scales of other agricultural colleges. Yale, Columbia, Chicago, and other universities of similar standing, have looked to the New York agricultural institutions for members of their teaching staffs. While such institutions as are mentioned above not only have brought their minimum salaries for professors to practically double the minimum paid in the New York State College of Agriculture, but also have brought their minimum for full professors to the maximum allowed the ablest professor here, it is not urged that New York should at once seek to bring the salaries here to the level of these privately endowed universities. It is strongly urged, however, that the salaries paid at the State College be very substantially improved as a matter of first importance.

The salary needs with respect to the professorial staff are of two kinds:

(a) There should be an appreciably higher maximum to which staff members continuing to render satisfactory service may look forward as within reach, gradually and systematically to be attained, having due regard to the varying abilities, aptitudes, and services of individuals. Specifically, qualified professors and heads of departments and administrative divisions should normally be able to look forward to a maximum of \$7500 a year. Qualified assistant professors should be able to attain a maximum of at least \$4500, instructors \$3000, and assistants \$1500.

It would be distinctly in the interest of the State and the College if the restriction on the maximum for assistant professors were removed altogether. It serves no good purpose, and works much harm by compelling, as at present, the giving of the title of professor in order to hold for some years men who are needed and to whom higher salaries must be paid. The greatest frequency of threatened loss is in this group. It is not necessary, desirable, nor possible to hold all assistant professors permanently, but it is frequently of great importance to retain individuals at given times. It should not be compulsory to confer the title of professor in order to make a financial adjustment required by the necessities of a situation.

It is similarly undesirable to be compelled to give the title of assistant professor in order to hold an instructor beyond the \$2400 limit. This difficulty would be largely removed, however, by making it possible to pay an occasional full-time instructor as much as \$3000.

(b) There should be provision for paying markedly higher salaries, at least up to \$10,000, to occasional men of outstanding achievement. The number of such cases is not likely to be large at any one time; but it should be possible to pay an occasional leader in his field a salary which, in part at least, recognizes his value to the State and justifies his continued resistance to attractive offers elsewhere.

For the non-professorial staff, the whole salary scale should be gradually and systematically raised. The salaries in these various service groups have undergone little change in many years. To bring these groups into line with the salaries paid for like services elsewhere in the State Government would not involve large sums but would yield substantial relief to the State College. The College is particularly embarrassed by the low salaries available to the various grades of technical assistants and to clerks, stenographers, and librarians. The adoption of a stated annual increase in these salaries for a period of years until the salaries are from one-fourth to one-third higher would meet the situation. The rapid turnover in certain of these groups, particularly among statistical clerks and stenographers, represents a very appreciable loss to the State and serious waste of time on the part of the members of the professorial staff who must continually break in new, young, and untrained workers. It should not be overlooked that the present low salary scale in these groups is costing the State heavily in the time of higher-paid teachers and investigators.

Housing. In 1910 the faculty and trustees presented to the Governor and the Legislature a building program for the State College of Agriculture, several units of which were erected in subsequent years. In 1919, at the request of the legislative financial committees, this building

program was revised and brought down to date. The revised program, carefully prepared with the cooperation of the Governor, the financial committees of the Legislature, the State Architect, representative committees of farmers, and the staff of the College, was submitted by the trustees to the Governor and the Legislature in 1920, and was recognized in legislation authorizing the construction of additional units therein called for. This authorization has as yet been realized only in part, being dependent on annual appropriations. It is highly urgent that this plan and program, which has retained its essential character for twenty years, should be carried systematically to completion in the years immediately ahead. The building needs of the College remain highly acute for several important departments. The plant-industry building, for which funds are now available, will greatly relieve the plant departments; but other essential departments are yet to be cared for.

The library is the educational center of any educational institution. The State has maintained the College for a quarter-century, but has not yet provided a library building of any description. Such a building has long been an imperative need and its urgency increases. The book collections are scattered in many buildings and are difficult to administer and to use. There is no place to bring related materials together, with appropriate rooms for study by staff and students. The reading room now available is wholly inadequate to seat the students desiring to use the library, and is ill suited to library purposes. There is no proper periodical room. Many books and pamphlets must be stored away in non-accessible places because of lack of shelf room. Both of the two major sections of the book collections are housed in inflammable buildings. There are numerous series of publications, acquired years ago, which could not again be acquired at any cost if destroyed. The fire hazard with these collections, now of considerable extent, is greater than the State should continue to take. Every consideration both of need and of safety points to the necessity that provision be made without delay for the erection of an adequate fire-proof library building. The plans for such a building have been drawn under the direction of the State Architect, and are now ready as a basis for an appropriation.

Agricultural economics has become, in the last decade, the field of major interest to farmers, and it has had a notable development at the New York State College of Agriculture. Not only has the Department of Agricultural Economics and Farm Management won the most cordial support and warm commendation of the farmers of New York, but the character of its work has attracted national and international attention. This work is of the highest importance. The department is housed under almost impossible circumstances, scattered in four separate buildings. The larger part is housed in two old structures, one an old stock-judging pavilion long since condemned by the State Architect, and the other a revamped poultry feed-house. Neither of these buildings can be adequately heated or ventilated, with the result that they are a positive menace to the health of the workers. It is not stating the case too strongly to assert that the necessity for improved housing has now become so acute that, unless speedily relieved, the holding of our present outstanding staff in this field will be jeopardized. Not a year passes without several members of this

department being asked to accept positions elsewhere at greatly increased compensation. As this field is now becoming of first importance at nearly every agricultural college and at several leading universities, the demand for able teachers and investigators is very great. There is the further factor that the preeminence of our own department has resulted in the coming of greater numbers of specializing students than can be properly cared for under present conditions. The new building called for in the plan should be authorized without delay.

Farm mechanics and agricultural engineering, which play a very large part in farm operations in New York, are housed chiefly in wooden sheds erected in part from an old barn. There is probably no other college of agriculture of any important standing in the United States at which the provision for this department of work is so inadequate. And yet New York ranks fourth among all the States in the value of machinery on farms, fifth in the use of gas and electric light and power on farms, and second in the number of farm homes supplied with running water. This department of the College should be given adequate housing and facilities.

The entomological collections of the College are among the greatest and most valuable in the United States. These collections, the product of more than fifty years of ardent searching and classifying, are invaluable. They are housed in Roberts Hall, a non-fireproof building. Their loss would constitute both a state and a national calamity. The staff and students of this department work under conditions of great congestion. Plans to relieve this need were first drawn by the State Architect about 1906, and a building therefor was included in the building programs of 1910 and 1920.

Smaller farm and field buildings are also very greatly needed. Barns for farm animals are insufficient. Practically no provision has yet been made by the State for sheep and swine, and no provision whatever for fat cattle. The State has never provided a tool shed, with the result that most of the machinery must stand outdoors, causing loss and a most unsightly condition for a state institution. The several small structures called for in the building program remain urgent necessities. A continuing policy of meeting these needs would quickly place the College in a competent condition to do its work. The amounts involved are relatively small but the facilities are indispensable to the proper functioning of the College.

Maintenance. Agricultural education and research are everywhere expensive—disproportionately so, as compared with other forms of education. Every State has to face this fact. Not only are the materials and facilities required—farms, barns, greenhouses, shops, livestock, many kinds of especially equipped laboratories, experiment fields, and the like—important as items of first cost, but in their management, supervision, and utilization they make heavy administrative demands on the time of the professorial staff, requiring, as they do, a large, diversified, and specialized operating force. Agricultural research is expensive and time-consuming, but it probably pays the largest dividends to the people of any investment made by the States. Millions are added in agricultural wealth in New York State every year by the work of the State Agricultural College and its agricultural experiment station. The annual value of the Department of Plant Pathology alone is estimated to be between one and two million

dollars. The work of the Department of Plant Breeding is annually worth more, to cite another example. The majority of the grain crops raised in New York are now planted from varieties developed by or tested and recommended by the College. The services appear costly to maintain, but they yield immense dividends to the wealth of the State.

Nearly all departments have insufficient funds for current equipments and supplies. The funds now provided are hardly sufficient for routine equipment, and leave very little for special apparatus and supplies. In certain departments investigations of particular problems, which become urgent, must be delayed for years before the needed apparatus can be provided. It is sound and effective economy to furnish a staff of scientific and technically trained workers with whatever facilities they require to prosecute their work, and at the time when needed. This item of appropriation should gradually be increased not less than 30 per cent for the present staff.

Travel. The travel funds must serve two major needs:

(a) The statistics show a steady increase in the number of contacts made in the extension work. The purpose of the State in maintaining the extension work is to aid the greatest possible number of farmers by means of an educational service. That this service should grow, that the demands on it should increase, should constitute at once the State's desire and the measure of success of the enterprise. The number of farmers served by the College grows annually; so also do the number of services to individual farmers. It must inevitably be so as farmers make increasing use of the results of agricultural research and teaching.

(b) Many lines of investigation which the staff must pursue require travel to the sources of material. In many fields these sources cannot be brought into the laboratory. For example, there must be frequent plant-disease surveys. Our pathologists must keep in touch with conditions from year to year, and note the changing trends in farming situations. They must note the relative prevalence of various diseases, their correlation with weather conditions and with farm or cultural practices, their correlation with new varieties of crops which may differ in susceptibility, the entrance of new parasites which may result in epidemics such as the chestnut blight or the white-pine blister rust, and must determine measures for control. There is pressing need for many different field-crop surveys, and for pasture surveys and local experimentation in regions in which the dominant pasture grasses are not the same as at Ithaca. In all studies of rural social problems, field surveys are the indispensable means. The building-up of a sound body of knowledge in farm management requires field studies of great numbers of farms with varying crop and livestock practices, on different soil types, and at varying distances from markets. The only way to assemble the necessary data for teaching and for advice to farmers on the very wide range of constantly pressing economic problems is to visit farms, marketing agencies of many kinds, and other businesses serving farmers, in order to obtain the methods and results of their operations.

The travel funds are at present seriously inadequate. Field work has had to be discontinued toward the end of the year in certain departments, and other field work has not been inaugurated which it would be desirable

for the College to undertake in order to increase its value to the State. The travel fund should be increased not less than 30 per cent in order to get a more nearly adequate return on the present staff.

Technical and non-technical assistants. Recognition should be given to the real economy of providing the teaching and scientific staff with sufficient subsidiary labor. The cost of the scientific staff is the heaviest charge. Many of these relatively expensive persons must now spend much time in routine work which could as well be handled by lower-paid technicians and helpers of various grades. The College is insufficiently manned in the matter of technical and non-technical assistance. In a number of cases the productivity of a scientist could be increased from 50 to 75 per cent if he were adequately provided with assistance costing about 30 per cent of his salary.

In all social and economic studies, statistical clerks are essential. They, with their equipment, correspond to experimental fields and laboratories in the natural-science departments. A single scientist can multiply his output of valuable economic material if he has sufficient competent statistical clerks.

The College could efficiently employ an increased staff of technical and non-technical assistants, with resulting benefits and economies to the State. The need is positive.

Miscellaneous labor. Because of inadequate general labor and maintenance funds, the Department of Plant Breeding has been forced to cut down its experimental plantings from 10 to 25 per cent in different projects; and yet its work is of immeasurable value to the State. Of the wheat acreage of the State, 90 per cent is planted to three varieties, of which two were developed by the College and the third was tested and recommended by the College; of the oat acreage, from 40 to 50 per cent is planted to varieties developed by or tested and recommended by the College. Other crops have been similarly benefited or are under test. It is uneconomical to reduce the services in this field because of inadequate labor. Nearly every department which requires general labor is seriously under-supplied, and the case of Plant Breeding is cited merely as an example. The college properties and farms are constantly unkempt and are unbecoming to a State institution. In the constant conflict between the requirements of appearance of grounds and the demands in experimentation, the former loses.

The appropriation for miscellaneous labor should be increased not less than 50 per cent. It is one of the items of greatest need. It is one of the essential items of support for a large and relatively expensive scientific staff.

Repairs. The item for repairs has never been sufficient to keep the buildings in proper condition. While the major items of appearance are cared for from year to year, there is serious shortcoming in many items of plumbing, steam lines, painting, and the like. An increase of \$5000 to \$10,000 a year would substantially improve the maintenance of the properties.

Director of the Experiment Station and Research at Ithaca. The appropriations for the College formerly carried a salary of \$6000 for a Director of the Experiment Station and Research at Ithaca. When the

State placed the State Experiment Station at Geneva under the trustees of the University, it was deemed by the University expedient to try having a single Director over both stations, Geneva and Ithaca. Accordingly the College voluntarily invited the Legislature to withdraw the appropriation for the Director of the Station at Ithaca; but in doing so there was recorded the fact that the proposal to have a single Director must be regarded as experimental and if it should prove impracticable the College would again request the restoration of the position. After five years of experience with two different Directors, both able men, the load has been clearly demonstrated as too heavy for one person. With the necessity that the Director must spend much time out in the State, there is inadequate time remaining to give proper attention to the work of the Stations. Experience has clearly shown the necessity for two officers, one at Geneva and one at Ithaca. The large expenditures for research at both places require the close and continuous supervision of resident executives. It is therefore requested that the salary for a Director at Ithaca be restored, and preferably at a higher rate than formerly in order to give the College greater freedom in selection of an incumbent.

Needs with respect to new activities. In common with all dynamic and serviceable state activities, there are needs pressing on the College for attention which the College would gladly meet if authorized and empowered by the State to do so. All of them are logical expansions of present activities, and are supplementary thereto in the interest of a fuller service to the farmers and rural communities of the State and to the students who come to the institution. New situations are constantly being met by the present staff, but the requirements in one direction or another run beyond the present personnel. They call for additional persons of special training adapted to the new problems to be taken up. The major scientific staff of the College is now provided, but there must inevitably be gradual expansion to take care of new situations. This is the history of all institutions.

Specifically, the canners and the potato growers are urging more attention to their needs, which can be met by an additional extension man specializing in these problems. Vegetable growers on muck lands have for years urged the College to undertake more extensive investigations of the soil and disease problems of muck-land crops. There are wide differences among muck soils. There are extensive areas of muck land in New York of great agricultural value. The provision of staff and facilities to take up these new problems would be in accordance with the State's policy of service to other groups of farmers. Other fields of soil science and plant science should be entered, as lack of knowledge therein not only limits the desirable service to growers but also not infrequently limits the prosecution of researches in related fields which await fuller knowledge in these supplementary fields. There is need for research men in the cultural phases of field crops and of pasture grasses, including both surveys and experimentation, as a basis for resident and extension teaching. There is need for a pathologist on the diseases of cereal crops, and one on the diseases of ornamentals in view of the extensive development of the nursery interests in New York. With the present staff it is almost impossible to give any attention to the diseases that develop in transit and in

marketing farm products. There are large fields in agricultural economics awaiting the appointment of additional qualified men, and the work on rural social problems needs further strengthening, both in teaching and in investigation, as a basis for resident and extension teaching. At least two additional library assistants are required to provide service and to help upbuild the library resources. The entire institution is handicapped both because the present library staff is inadequate for the load it has to carry, and because funds are insufficient for the acquirement of books and journals, which are primary necessities of an educational and research center. With additions to the professorial staff, there must be considered the subsidiary assistance and maintenance funds necessary for their adequate operation.

Much research is conducted by the staff through graduate students, and it is the least expensive of all forms of research. At the same time, the growing number of advanced students requires that facilities and apparatus suitable to their problems—books, funds for travel to the sources of material for the researches, and the like—be provided.

Land. The College greatly needs an area of fifteen or twenty acres of land suitable for work with vegetables, such as could be obtained in the valley near Ithaca. It needs one or two additional outlying experimental fields of a wholly different soil character from any now in its control, for work on problems of soil fertility on these types and for crop demonstrations. Such areas should be each about ten acres in size. The College also greatly needs a mature orchard, under its control, on a typical fruit soil in western New York.

Conclusion. The foregoing and other needs of the College have been discussed in detail in previous annual reports of the College. It is not anticipated that the needs set forth in this statement will be met in one year. If a substantial beginning can be made the first year so as to relieve the accumulated pressure of need, the fuller relief herein called for can be provided in subsequent years. If a constructive program, built on full knowledge and understanding, to bring the College to the level of maintenance and efficiency which is clearly desirable were adopted and consistently carried forward, the efficiency, the service, and the spirit of the New York State College of Agriculture would be correspondingly promoted.

The plant-industry building

It is with the keenest interest and appreciation that record is made of an appropriation of \$1,100,000 from the state bond issue for public improvements, granted by the Legislature of 1928 and approved by the Governor, for the erection of the plant-industry building. Funds for the erection of this building had been systematically sought for many years. It represents the most urgent housing necessity of the College. When the Departments of Botany, Plant Pathology, Plant Breeding, Pomology, and Floriculture and Ornamental Horticulture, are moved into it from their present most inadequate quarters, several other departments will be correspondingly relieved by the space thus released. Provision for the immediate erection of this building is a source of much gratification to

the entire institution and to the host of farmers who have cooperated in urging its importance. With most of the foundations already laid, the construction should be moved to early completion.

Special temporary fellowships and investigatorships

During the year the following special temporary fellowships and investigatorships for the promotion of research, established on funds provided by farmers' organizations, commercial agencies, and others, became effective:

The Corning Glass Works fellowship, beginning on October 1, 1927, and carrying a grant of \$1700 a year for two years, for the furtherance of investigations dealing with the value of sunlight in preventing or curing rickets in chickens, with special reference to the minimum effective exposure required, the effect of variation in the quality of sunshine under seasonal and weather conditions, the value of indirect exposure or reflected ultra-violet rays of sunlight, and the relative influence of different types of glass upon the transmission of the ultra-violet rays of sunlight which have an antirachitic effect.

A cooperative fellowship maintained jointly by the Boyce-Thompson Institute for Plant Research, the Horticultural Society of New York, the New York Botanical Garden, and the New York State College of Agriculture, for the study of diseases of lilies forced in greenhouses. The fellowship continues for two years.

Renewal of the Champlain Valley Fruit Growers' Association fellowship, for a period of two years beginning on April 1, 1928, and carrying an annual grant of \$1250. Under this fellowship, investigations and demonstrations of the nature and control of apple diseases and insect pests, with special reference to the cork and drought spot diseases, have been maintained and will be continued.

Renewal of the Genesee-Orleans Vegetable Growers' Cooperative Association fellowship, for a period of two years beginning on April 1, 1928, and carrying an annual grant of \$1250. Under this fellowship, investigations of the nature and control of diseases and pests attacking muck crops have been maintained and will be continued. This fellowship previously existed under the name of the Western New York Farms Corporation fellowship.

The American Dry Milk Institute fellowship, for a period of nine months beginning on February 1, 1928, and carrying a grant of \$2000. Its purpose is to further the investigation of the value of dry skim milk in feeding calves.

The Niagara Sprayer Company fellowship, for a period of two years beginning on April 1, 1928, and carrying a grant of \$1500 a year. The purpose is to enable the investigation of factors involved in the application of dusts for the control of diseases and insect pests of orchard and other crops.

The Charles Lathrop Pack fellowship, in nature education and forestry, established by the Charles Lathrop Pack Forestry Trust, for the years 1928-29 and 1929-30. For the support of these fellowships the Trust has given the University \$3000 a year, for the maintenance of two or

more fellows. The investigations conducted under these fellowships are to deal with problems of nature education and forestry, with the object of determining methods and practices affecting the education of the public in the use of its natural resources. These are the first fellowships which the University has received for investigations in fields and methods of education. Because of the significance of public understanding with respect to the utilization of natural resources, these fellowships are particularly timely.

The International Agricultural Corporation fellowship, effective on September 1, 1927, for a period of two years, and carrying a grant of \$1600 annually. The purpose is to determine the usefulness of phosphatic limestone and of treble superphosphate in the calcium and the phosphorus nutrition of animals.

The Oswego County Farm Bureau and the Oswego Vegetable Growers' Association fellowship, for a period of two years beginning on October 1, 1927, and carrying a grant of \$1000 a year. The purpose is to promote investigations of diseases of vegetable crops and to demonstrate methods of control thereof.

The Armstrong fellowship, established by the Armstrong Tree Service, Ltd., for a period of two years beginning on June 1, 1928, and providing an annual grant of \$1250. The purpose is to enable the investigation of the diseases of shade and ornamental trees.

The United Fruit Company fellowship, for the year 1927-28, carrying \$750, for the purpose of furthering a physiological study of the effect of chilling on the banana fruit.

The American Dry Milk Institute investigatorship, for a period of one year beginning on July 1, 1927, and providing a grant of \$2000. The investigations are concerned with the value of dry skim milk in mixtures for the manufacture of ice cream.

The New York Central Railroad investigatorship, for a period of two years beginning on January 1, 1928, and carrying a grant of \$300 a month for salaries of persons engaged in the investigations, with additional provision for travel and maintenance as may be required for field work. The purpose is to make possible a state-wide survey of the potential milk-production capability of the State, in order that information may be available for the sound and economic development of the New York milk shed.

Of special importance, because of the general representation of the farmers of the East in its maintenance, is a temporary investigatorship supported jointly by the Dairymen's League Cooperative Association, Inc., and the Cooperative Grange League Federation Exchange, Inc., for the purpose of furthering the investigation of the plane of protein intake in rations for milk production. For the support of this investigatorship, which will extend for a period of two years and six months from May 1, 1928, each of these two cooperating agencies has given to the University the sum of \$7500, or a total of \$15,000.

The Laura Spelman Rockefeller Memorial provided a special grant of \$1500 a year, for two years, for the conduct of special investigations under the auspices of the Department of Rural Social Organization, of problems in parental education.

These special temporary grants are of the greatest assistance to the College in making possible the investigation of specific problems of immediate importance and in furthering the training of graduate students in methods of research. They thus serve a dual purpose, both parts of which lie close to the interest of the University as a research center. The generous cooperation of the donors is cordially acknowledged. These grants constitute a distinct public service fostered by private initiative and expense. The University welcomes such assistance, and is glad to consider proposals which have a distinct public value and which do not limit the University in formulating its own procedures and in utilizing the results for the public welfare.

It may be of interest to record that, since 1909, the College has received funds for the establishment of sixty-one temporary fellowships and investigatorships, usually of one or two years duration but occasionally longer. Of these, thirty-eight were for work in fields of plant pathology. Altogether, twelve departments of the College have at various times had such fellowships. In total, they have added to the funds available to assist graduate students and to promote research the sum of \$162,938. They have enabled the solution of many problems of economic importance to farmers, and have yielded results of far-exceeding value.

Strengthening research and graduate study at the University, particularly in plant science

In the spring of 1928 there was brought to a successful conclusion an intensive study, extending over a period of two years, as to the more fundamental needs for the higher development of agricultural research and for the training of men therein in certain fields embraced within the College of Agriculture, with special reference to the several departments of plant science and the general sciences on which they rest. In conjunction with the agricultural studies, the President of the University also directed a careful analysis of the major needs of the underlying science departments in the University, more particularly those of chemistry, physics, mathematics, and zoology.

It became evident that, in addition to strengthening and expanding certain existing fields of inquiry and of graduate instruction, the opportunity for the most notable advance under the conditions existing at Cornell University lay in the borderlands between chemistry and biology and physics and biology, and in the borderlands between certain of their specialized branches which have come to be denominated as the fields of agricultural science. Specifically, the studies culminated in a program which, in addition to recognizing certain needs of mathematics and zoology, projected the very substantial expansion of facilities for physiology in its general and special aspects, in biochemistry and biophysics, and in those phases of agricultural science embraced within physiology — cytology, anatomy, plant pathology, genetics, and some aspects of soil science. The most outstanding needs in the present organization are for a strong development in biochemistry and biophysics, which have become indispensable for the promotion of knowledge in plant and animal biology, and for provisions for work of a fundamental character in such special

fields as cellular microchemistry, the chemistry of phytopathology, pathological plant anatomy, the physiology of fungi and of insects, genetics, cyto-genetics, and aspects of plant nutrition.

Anatomy and physiology (structure and processes) are the essential fields of inquiry in plant science. Problems in physiology are problems involving chemistry and physics, more especially biochemistry and biophysics, with contributions coming in from mathematics. Cell physiology, cell behavior (cytology), and chromosome behavior (genetics) require the fullest exploration, as the advancement of knowledge in botanical science centers increasingly about the cell.

The pathological aspects of anatomy and physiology, the interrelations and interactions between the host plants and the fungous and insect parasites, are coming now to be recognized as largely physiological relations. The physiology of pathological organisms and its relation to the physiology of the host have come to the fore as fields of fundamental significance.

Researches in plant nutrition and in the physical chemistry of soils, directed to a study of soil colloids, are assuming increasing importance both in the advancement of plant science and in the training of future research workers in plant physiology and soil science. Significant developments may be expected in both of these fields.

Provision already exists at Cornell University for certain work in plant physiology, anatomy, cytology, genetics, pathology, and soil science. It is not adequate, however, to the higher needs either in research or in graduate study. There is need to strengthen the whole situation, both by making provision for new chairs in fields which now appear to be the main leads for the future, and by freeing a few of the scientists of greatest productivity from undergraduate and routine demands and giving them assistance so that they will have more time for original work and for the supervision of graduate students.

The program resulting from the study just described, and including both the general science and the special agricultural phases, calls for endowments in the sum of \$9,000,000. The President of the University has courageously faced the task of seeking the necessary funds. The General Education Board, one of the Rockefeller foundations, has indicated its very keen interest in the program, has examined the proposals in detail, and has authorized financial cooperation with the University on a generous scale toward its realization. In conformity with the Board's practice of making its grants conditional on the securing of the additional funds required from other sources, the full realization of this important development must await the generosity of other donors. It is a field of investment worthy of the hearty participation of persons desirous of using their wealth for the advancement of learning and for the enduring benefit of mankind.

While this undertaking is of vital significance to the entire University, and important parts of it lie outside the existing organization of the College of Agriculture, this College will be peculiarly aided by every aspect of it, because of the increasingly close integration of the fields of knowledge in agriculture with the foundation sciences, and the dependence of scientific inquiry in agriculture on the progress of knowledge in chemistry, physics, and biology. The attractiveness of Cornell University as a center

for scientific research and for graduate study will be materially enhanced when this contemplated program becomes an accomplished fact.

Proposed graduate school of tropical agriculture in Porto Rico

There is a highly developed and constantly growing interest on the part of American men of science and American business and financial interests, in the fuller development of the agricultural resources in tropical America. Large holding companies in New York and elsewhere are already heavily involved in the utilization of tropical areas and land products, and are in constant search for men of scientific training in agriculture, with special knowledge of tropical conditions, to help them cope with the special production problems characteristic of tropical countries. But an even greater and more important interest has been expressed by the governments of certain tropical countries themselves, and by their larger and more progressive leaders, for the aid of science both for the solving of countless agricultural problems pressing upon them and for the higher training of native teachers and investigators to deal with their local situations. These two lines of interest have now met in proposals for the establishment in Porto Rico of a graduate school of tropical agriculture under the guidance and auspices of an American university having a strong college of agriculture and one at which graduate study already has attained considerable development.

Approximately six years ago, the National Research Council of the United States appointed a committee, representative of the fields of science immediately concerned, to consider how and where and of what nature a graduate school of tropical agriculture might be established. After careful consideration of various possibilities, Porto Rico came to be considered as offering attractive possibilities. Following visits of representatives of the National Research Council to Porto Rico in the summer of 1927, on the invitation of the government of the island, the decision was reached to favor Porto Rico as the location for the proposed school. This conclusion was aided by reason of the liberal cooperation which the government officials in Porto Rico promised to extend, as well as by the natural advantages and the fact that Porto Rico is American territory.

Cornell University, which has cooperated with the authorities of Porto Rico in various matters, was suggested as the institution under whose guidance the graduate school should be fostered. In the fall of 1927 the Governor of Porto Rico, the Honorable Horace M. Towner, visited the mainland of the United States and in person formally invited Cornell University to cooperate with the Government of Porto Rico and the National Research Council in the inauguration and development of the school. Consideration of the matter by the University was furthered by the advice of representatives of the National Research Council and of its special committee for the establishment of a graduate school of tropical agriculture, who met in conference with Governor Towner and representatives of Cornell University.

On the invitation of Governor Towner, members of his cabinet, and leaders in the Porto Rican Legislature, Cornell University sent to the island in March, 1928, a committee consisting of the President of the

University, the Dean of the College of Agriculture, and the Professor of Plant Physiology, to make a personal study of the situation and to confer with the Government as to possible procedures and measures of cooperation. The visit was most gratifying. The possibilities which the proposal afford for the development of a strong institution under mutually satisfactory conditions became clear. The attitude of the Governor and of other government officials in Porto Rico, and of the President of the University of Porto Rico, was most generous. The whole setting seems auspicious.

Following the visit by the representatives from Cornell University, the two houses of the Porto Rican Legislature passed, and the Governor approved, a joint resolution formally inviting the cooperation of Cornell University and defining the desired procedure and the respective obligations and responsibilities of the proposed cooperating parties—the Government of Porto Rico, acting through the trustees of the University of Porto Rico, and Cornell University. This resolution set up a provisional board which it empowered, in the name of The People of Porto Rico, to enter into contracts and agreements with Cornell University for the establishment of a graduate school of tropical agriculture in Porto Rico. The administrative conditions and the provisions for financial cooperation on the part of the insular government were set forth in a form believed to be satisfactory and acceptable to Cornell University.

The trustees of Cornell University have not yet acted on the proposal. There will be involved on the part of the University, the raising, from private sources, of a considerable financial foundation in order to enable the University appropriately to participate as the importance of the undertaking warrants. It is anticipated that the proposals will receive formal consideration by the trustees of Cornell University in the near future. The proposal is one of the first order of importance from the standpoint of the tropical countries and their sound and successful development, and of the advancement of the science of agriculture and the training of men therein.

Educational policies and procedures

The student honor system which has been in operation in the College for many years under varying forms of administration, was again submitted to study and modification during the past year. As in many other colleges, the plan has here met with only partial success and has not had the complete confidence and support of either students or faculty, though the general principle of major student responsibility in these matters is generally acknowledged. For many years past, the plan of operation has been to place responsibility for dealing with fraud in examinations, and with other similar delinquencies, wholly in the hands of students. There is no reliable measure of the success of this plan as contrasted with faculty control, and opinions differ. It relieves faculty members of a sometimes unpleasant duty, and has the virtues inherent in a process of self-government. On the other hand, it labors under the difficulty of bringing a large population whose total membership changes rapidly, to a high degree of cooperation in a matter which is admittedly hard to control by any

measures whatsoever. Further, it is questionable whether instructors should be wholly withdrawn from the conduct of examinations, which is after all a part of the teaching process. The plan now adopted in the College attempts to make each class the unit primarily responsible, and to establish cooperative action on the part of the individual instructor and his class, with review by a central committee. This method has been in operation for too brief a period to demonstrate its merits.

The rules governing delinquency in scholarship have been modified by allowing first-year students to continue after one term of unsatisfactory record if there is reason to believe that the causes can be rectified or if it seems desirable for the Office of the Director of Resident Instruction, in cooperation with faculty advisers, the Dean of Women, or other agencies, to have a longer period in which to study the needs and conditions of such a student's work. The purpose of this legislation is primarily to allow greater opportunity for a study of the causes of poor scholastic work in particular cases, and to set in operation such remedial measures as may be appropriate. It is distinctly not intended that it shall operate to retain ill-adapted students for a longer period than hitherto with detriment to the level of the class work, but instead to make more definite provision early in such a student's course for a closer determination of his correct educational placement than has hitherto been attempted. The development of this work may call for additions to the staff of the Office of the Director of Resident Instruction.

The necessity of restricting enrollment in various colleges in the University, and the consequent problem of selecting students on tests additional to the ordinary scholastic entrance units, has led to the establishment of a separate University Office of Admissions. The faculty of the College of Agriculture has concurred in this action and will cooperate fully in the new procedures. Under this plan of organization, the College will direct its attention to determining the types of students most desired and will cooperate with the Director of Admissions in setting up admission procedures designed to facilitate the entrance of these types and to discourage others. The problem of college entrance involves not only insistence upon a desired level of scholastic ability, but quite as much a sorting of individuals into the right channels of training. Obviously, the central Office of Admissions must rely upon the close cooperation of college offices to attain this end.

In the College of Agriculture there has been in recent years no excess of students; in fact, the staff has found opportunity to turn its efforts more largely to research than in the earlier years of heavy enrollment. In spite of the decreasing number of students the College has nevertheless given more attention than formerly to the qualifications of applicants for admission. The need for this was accentuated by the action of the College of Arts and Sciences in drastically restricting its enrollment. The result of that action was that many students having the full scholastic entrance requirements, but nevertheless not granted admission to the College of Arts and Sciences, applied to the College of Agriculture in the hope of later transfer. The College of Agriculture has therefore insisted that the student must show that his purposes are in line with the objectives of instruction in the College, and regards previous application elsewhere

as presumptive evidence to the contrary. It is recognized, of course, that young men of college-entrance age are not prepared to settle altogether definitely the ends to be served by their college training, but it is fair to insist on reasonable assurance of intent on entering a college giving professional training. It may be noted, however, that some of the colleges of agriculture are reacting to the present condition of low enrollment in a more liberal way, encouraging the development of lines of work not strictly agricultural and seeking to establish themselves as colleges of science as well as of agriculture. There is thus involved a question of the functions of these institutions that deserves the most careful consideration in their respective States.

For several years, all students in the University have been required to take work in hygiene and preventive medicine throughout the freshman and sophomore years. This work has now been reorganized to a more definite credit basis, and, by vote of the faculty, two hours of credit in this subject are now added to the requirements for graduation.

A. W. Gibson, whose work in relation to former students has grown up with the Office of Farm Practice, has this year been transferred to the Office of the Director of Resident Instruction. He is to continue his work with former students, and, so far as time permits, will develop new work in vocational guidance and in the placement of students. There is an increasing use by departments and other organizations of the files of addresses and other information on former students, and there is frequent request that the directory of former students published five years ago be replaced by a new issue. An occupational file will be added as soon as possible, it being essential in the placement service and useful in providing selective lists for various other purposes.

A study of students who have entered the four-years course in the College of Agriculture but have not remained for graduation, and of the reasons for their discontinuance, has been made by Mr. Gibson, and the results, which cannot be given here in detail, deserve careful consideration in relation to various college policies. The group of men students who were not graduated covering the entire history of the College up to June, 1923, numbered 2146, or 46 per cent of the total number of entrants. The study is based on data received from 1021 of these men.

Change of mind with regard to occupation was the reason most commonly given for discontinuance. This cause was assigned by four times as many men proportionately of those who had had no farm experience, as of those who were farm-reared.

Financial reasons were second in frequency, and these may be held to include difficulty in meeting college expenses, difficulty foreseen in getting enough money to start in business at the end of the course, difficulty foreseen in making an income large enough to justify college preparation, and need of services at home. Reasons of this kind were given by 23.8 per cent of men without farm experience, and by 65.9 per cent of those who were farm-reared.

Other reasons assigned were: health, by 16 per cent of those replying; scholastic difficulties, by 9.2 per cent; dissatisfaction with work offered, by 5 per cent; business opportunities not to be deferred, by 12 per cent; and the World War, by 14 per cent.

Enrollment for regular and special instruction

The enrollment of students for the past two years is as follows:

	1926-27	1927-28	
Freshmen	207	199	
Sophomores	174	167	
Juniors	180	167	
Seniors	147	158	
	<hr/>	<hr/>	
	708	691	
Special students	31	24	
Winter-course students:			
Agriculture (general)	27	55	
Dairy Industry	22	36	
Poultry Husbandry	14	12	
Fruit Growing	4	3	
Flower Growing	12	23	
Vegetable Gardening .....	..	4	
Rural Engineering .....	..	9	
	<hr/>	<hr/>	
	79	142	
Graduate students	272	286	
Summer-school students	648	725	
	<hr/>	<hr/>	
	1,738	1,868	
Less number counted twice.....	76	101	
	<hr/>	<hr/>	
	1,662	1,767	
	<hr/> <hr/>	<hr/> <hr/>	

As in other years, there have been a large number of short schools and other informal gatherings held on the campus. The more important of these are here listed:

Tenth annual poultry-judging and -breeding school, June 27 to July 2, 1927..	89
Summer school for town and country pastors, July 11-23, 1927.....	140
New York State Seed Improvement Association, July 18, 1927.....	99
Broome County Home Bureau picnic, August 3, 1927.....(est.)	250
Picnic of Finnish farmers, August 6, 1927.....(est.)	150
Sixth annual New York State poultry-production show, November 15-17, 1927 (133 exhibitors, 859 birds).....(est.)	250
Second annual poultry- and egg-marketing school, November 28 to December 3, 1927	25
Indian farmers' school, December 12-16, 1927.....	38
Twenty-first annual Farm and Home Week, February 13-18, 1928.....	5,061
Annual extension conference, Northeastern States, February 21-23, 1928.....	65
Directors of Research, Northeastern States, February 22-23, 1928.....	14
School for spray-service men, March 19-24, 1928.....	25
Extension-service conference, March 26-30, 1928.....	131
School for grange lecturers, April 9-14, 1928.....	190
Tour of German educators, April 14-16, 1928.....	26
Parent-Teachers Institute, May 7-11, 1928.....	75
Conference of fertilizer salesmen in cooperation with the Soil Improvement Committee of the National Fertilizer Association, June 21, 1928.....	47
Chemung County Day at Cornell, June 22, 1928.....	74
Seventh annual Junior Field Days, June 25-28, 1928.....	2,144
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Total	8,893
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Changes in staff

Each year brings some changes in staff and the loss of associates who have served the College and the State with devotion and with credit to themselves and to the institution. The last annual report announced the resignation of Dr. R. W. Thatcher as director of research, to accept the presidency of the Massachusetts Agricultural College. Frank Barron Morrison, Professor of Animal Husbandry and Assistant Director of the Experiment Station at the University of Wisconsin, was appointed to succeed Dr. Thatcher, and assumed his duties at the College on October 1, 1927. Director Morrison was graduated from the University of Wisconsin in 1911, and subsequently pursued graduate study there. Immediately on graduation he was appointed an assistant and later an instructor on the staff of the Wisconsin College of Agriculture, and in 1914 he became assistant professor of animal husbandry, in 1917 associate professor, and in 1919 professor of animal husbandry. He served also as assistant director of the Wisconsin Experiment Station from 1915 until coming to Geneva. Director Morrison's writings and lectures have made him known to scientists and to livestock men in every State. He brings to the post excellent scientific training in animal nutrition, a broad practical knowledge of livestock feeding and management, and years of teaching and administrative experience. His long association with the Wisconsin Experiment Station acquainted him with the problems and methods of station research. He is eminently qualified for the post to which he has been appointed.

At the beginning of the year, Walter W. Fisk, professor of dairy industry, who had been a member of the departmental staff since 1910, resigned to engage in commercial work. At the close of the year Dr. H. W. Schneck, assistant professor of vegetable gardening, after association with the College for fifteen years also resigned to accept a more lucrative post in commercial work. F. G. Behrends, extension professor of rural engineering, resigned on June 30, 1928, to accept an especially attractive post as director of Hope Farms, a community and school for children, at Verbank, New York. George H. Rea, extension assistant professor of apiculture, resigned on March 31, 1928, owing to persistent ill health. Jay Coryell, for many years the competent leader of county agents in the State, resigned on March 15, 1928, to engage in farming. His administration of this large, exacting, and essential phase of the extension service was markedly successful, and constitutes an important chapter in the history of extension teaching in New York.

L. R. Simons, who had served efficiently for several years as assistant county agent leader, was advanced to the position of leader of county agents, to succeed Mr. Coryell.

Miss Cora Binzel was reappointed professor of rural education, effective on October 1, 1928, after an absence of one year, during which she gained valuable experience in the training of commercial employees in a well-known mercantile establishment.

Effective on February 1, 1928, Dr. Richard S. Uhrbrock was appointed assistant professor of psychology in the Department of Rural Education. Dr. Uhrbrock received his bachelor's and master's degrees from the Car-

negie Institute of Technology in Pittsburgh, and later qualified both for a master's degree and for the degree of doctor of philosophy at Columbia University. His special training and subsequent experience have been in educational psychology and mental testing, personnel work, and educational measurements. In addition to experience in industrial personnel work, Doctor Uhrbrock taught at the Carnegie Institute of Technology and the University of Wyoming, coming to Cornell from the latter institution.

The death of Isaac Phillips Roberts

On March 17, 1928, death removed that historic figure in American agricultural education who for thirty years guided the teaching of agriculture at Cornell University, our former Director, Isaac Phillips Roberts. Although he retired from his directorship in 1903, his spirit and ideals continued to permeate the institution, and his teachings, his personality, and his example were portrayed to the succeeding generations of students. He was held in marked affection by farmers throughout the State and by all of his former colleagues who are still among us. After his death the following resolutions were adopted by the faculty of the College of Agriculture :

"Isaac Phillips Roberts was born at East Varick, New York, July 24, 1833. He became Professor of Agriculture in Cornell University in 1873. He was made first director of the College of Agriculture in 1896 and retired professor emeritus in 1903. He died at San Francisco, California, March 17, 1928.

"For thirty years Isaac Phillips Roberts was the exemplification of agriculture in Cornell University. He taught the subject wisely, managed the farms successfully, directed the students in their many activities with sympathy and good judgment, bore the difficulties of a pioneer period with courage and unfailing hopefulness, and was a trusted counsellor and leader with his colleagues. He was admired and trusted by the farming people of the State, and became an acknowledged master throughout the country on the subjects associated with agricultural education. In the period when the rural subjects were unorganized pedagogically and when the way was not plain, he held the work clearly and definitely for agriculture and had always in mind the welfare of the farming people; and in so doing he made a basic and enduring contribution. He lived to see his faith justified and established. His memory will occupy a large place in the history of the University.

"For these reasons and for all the associations that cluster around such an upright and devoted life, it is now

"Resolved, That we, the faculty and staff of the College of Agriculture, owe it to the memory of Professor Roberts, to ourselves and the public, to make here a formal and heartfelt acknowledgment of our indebtedness to his life, character, and accomplishment; we place ourselves on record as his beneficiaries and are grateful that he lived to the fulness of his years; we wish the College always to hold his name in reverence; and we express our sorrow to all his survivors at the termination of his career."

The retirement of Henry Hiram Wing

On June 30, 1928, Henry Hiram Wing retired from the professorship in animal husbandry and the headship of that department, after forty years of service at this institution. Professor Wing, a native of New York, entered Cornell University for the study of agriculture in 1877, and was graduated four years later. After holding the positions of Assistant Director at the New York Agricultural Experiment Station at Geneva and Assistant in Agriculture and Farm Superintendent at the University of Nebraska, he returned to Cornell in 1888 as Deputy Director and Secretary of the Cornell University Agricultural Experiment Station. From that date his service was continuous until his retirement. In 1891 he became assistant professor in animal industry and dairy husbandry, and for the past quarter of a century he has been professor of animal husbandry and head of the department. The history and development of animal husbandry at Cornell University are therefore practically coincident with Professor Wing's responsibility for this field. He has witnessed the growth in physical facilities from a one-room combined office, library, and laboratory in the north end of Morrill Hall, to the present very substantial facilities in the excellent classroom building, the stock-judging pavilion, the barns, and the herds. The growth in staff has been proportionate. He leaves a well-established, going organization which has rendered valuable service to every section of the State in addition to the efficient teaching of many generations of students.

Professor Wing's contribution to feeding practices and livestock management and to the testing and recording of milk and butterfat production as a basis for livestock improvement, his pioneer service in the introduction, establishment, and long supervision of the system of official testing and advanced registry of purebred animals, and his notable development of the Glista family of Holstein-Friesian cows in the university herds are achievements of great practical benefit not alone to the dairy farmers of New York but also to those of the Nation. In his teaching he never lost sight of the practical problems and circumstances of the farmer, and he kept always in mind the requirements of application.

Professor Wing's unusually retentive memory, his sound judgment, and above all his lofty personal ideals, his frankness and sincerity, endeared him to his associates and his students, and won for him confidence and respect among farmers throughout the State. He has well earned the relaxation which retirement from active service brings.

At his retirement, the trustees of the University elected Professor Wing as Professor of Animal Husbandry, Emeritus.

DEPARTMENTAL ACTIVITIES, WITH SPECIAL REFERENCE TO THE RESIDENT INSTRUCTION OF STUDENTS

Items of general interest in the work of the several departments, especially with reference to the resident instructional program, are recorded in the following pages. In later sections of the report will be found a discussion of the research and extension activities of the departments.

Agricultural Economics and Farm Management

The work in the Department of Agricultural Economics and Farm Management covers a number of different fields: farm management, marketing, operation, prices, statistics, the history of agriculture, accounting, business management, rural economy, and taxation. Each of these is a highly specialized field. In view of the constant changes in agriculture and the momentous issues involved in recurring agricultural crises, instruction in these fields has assumed large importance and is essential in the curriculum of students preparing for farm management and for posts dealing with the economic problems of agriculture. It is now imperative that persons preparing for work in these fields shall have the latest and fullest knowledge available in many of these branches, and shall have established methods of study and contacts with sources which will keep them in touch with the progress of knowledge and experience.

To meet this urgent and growing need, provision must be made on a somewhat large scale for two controlling situations: there must be continuous and extensive research in the whole range of problems involved, in order that the facts may be found and a dependable body of knowledge developed; and there must be a large body of qualified teachers and investigators in training, both for the agricultural colleges and experiment stations, for the departments of agriculture, and for the ever-increasing number of farmers' organizations and of industries serving agriculture which are calling for persons of superior preparation in these fields. While the young man who goes to the farm may gain the insight which requires in the undergraduate courses, three or more years of postgraduate study have now become a necessity for those who are to occupy the more responsible technical and professional positions.

The general and the particular interest in these fields of study are indicated by the fact that in the 1927 summer courses offered in this department there were 105 registrations; in the short winter courses of 1927-28 there were 57 registrations; and in the courses offered during the regular academic year there were 882 registrations. Further, as an indication of the demand for persons of higher training in the several branches represented in this department, the enrollment of postgraduate students was as follows for the year in question:

Men who already hold doctor's degree.....	3
Majors for doctor's degree.....	34
Minors for doctor's degree.....	28
Majors for master's degree.....	21
Minors for master's degree.....	17
	<hr/>
Total different graduate students.....	103
	<hr/> <hr/>
Different foreign countries represented.....	12
Different American States represented.....	32
	<hr/> <hr/>

There need to be one or more highly equipped centers in the United States for graduate work in these fields. Because of its diversified agriculture and the proximity to many cities with serious problems of food distribution, New York makes an ideal place for such study. It should be

recognized that a State which draws its food supplies from the world may well contribute generously to graduate study in the economics of food production and distribution.

A new course in the public problems of agriculture was given during the year 1927-28, with 31 graduate students and 42 undergraduates students. Many other graduate students attended the lectures. In this course some of the more important problems related to agriculture were discussed, such as land utilization, forest policy, land reclamation, rural waterways, rural electrification, credit. Little attention of a scientific character has been given to the public problems of agriculture. The problems of government in relation to agriculture are highly intricate and are constantly changing. These problems call for most thorough knowledge and understanding. Rural government is the most neglected of the functions of government, and young men preparing for country life should be made intelligent with respect to the relations of government — local, state, and national — to agriculture. The service of the College to the State would be greatly strengthened by the addition of a professorship in rural government. There are also a few other important fields for which appropriate provision has not yet been made.

Studies in the field of transportation were begun some years ago. The persons in charge left and the work has not been taken up again. The importance of the transportation problems of agriculture warrants the creation of a professorship in this subject, with facilities both for research and for teaching. For several years one professor, now seriously overloaded, has been dividing his time between farm management, farm finance, and cooperative marketing. There should be a professor of farm finance and a professor of cooperative marketing.

Many valuable materials bearing on the history of agriculture in New York are rapidly disappearing. If work is quickly begun in this field, a large amount of valuable material can be saved. The historical background of agriculture and of agricultural movements and developments must be understood if one is to deal intelligently with their issues in the present day and with new programs which are proposed from time to time. Knowledge of the history of agriculture is requisite for the interpretation and evaluation of agricultural movements, present as well as past. Provision for a full-time professorship in agricultural history has become desirable.

The work of this department would be notably advanced if the State would provide funds for the creation and maintenance of the professorships here indicated. Funds are needed also for more research assistants and instructors, whose researches are of great value to the State. The range of agricultural-economics problems is so vast, and the immediate economic situations are so pressing, that a large corps of research workers could be profitably utilized.

Agronomy

The undergraduate instruction in soils, as now conducted, is intended primarily for students in technical agriculture and has a distinctly agronomic bearing. The growth of enrollment in forestry and the increasing

interest in the problems of forest soils have necessitated consideration of the question of organizing an introductory course particularly suited to the needs of forestry students. Decision is pending. It is believed that such a course would not only be more serviceable to forestry students than are the present courses, but would also economize their time.

The past year has seen an important development of the soils work of the Department of Agronomy, in the inauguration of the laboratory for the study of forest soils to accommodate the Charles Lathrop Pack Professor in Forest Soils. After the most careful search, Dr. Lars-Gunnar Romell, of the Swedish Forest Experiment Station at Stockholm, was selected for this professorship. Dr. Romell brings to the position a thorough training in plant physiology, with extensive supplementary work in chemistry and bacteriology and the ripe results of ten years of research in forest soils in association with the distinguished Dr. Hesselman, of Stockholm. Dr. Romell is now equipping his laboratory and is making a preliminary study of the forest soils of New York and other eastern States. He will work in close cooperation with the Department of Forestry at the College. Because of the basic importance of a knowledge of forest soils, and the growing necessity for every aid to our forestry development in America which science and experience can bring, the inauguration of this research program, with its provision for the training of a limited number of specialists, is considered a forward step of much significance.

Botany

The fundamental importance of the courses in botany to all of the departments of plant science throws on the staff of the Department of Botany a heavy teaching responsibility. Because of the individual nature of much of this work, the demands on the staff have become very great, and there is real need for more assistance of the lower grades such as instructors and technical assistants. The individual-conference plan of instruction in the beginning course, with its large enrollment, is highly successful but very time-consuming. Graduate instruction, which is largely individual, has become heavy in its demands but is a service of first importance to all of the plant fields.

There were present in the department during the year six special visiting fellows. Four of them were interested in cytology, one in physiology, and one in the eradication of weeds. One was a former National Research Council fellow. The other five were from foreign countries, sent here on fellowships granted by the International Education Board.

The past year has been an exceptionally profitable one for the herbarium. In all, 13,760 specimens have been acquired, a number which has been exceeded in only one previous year. Among these were the set of 6000 specimens collected by Dr. Wiegand and Dr. Manning in the southeastern States last summer; 2800 specimens received from the Gray herbarium in exchange for duplicates from the Burnham herbarium; 1000 plants from the South Sea Islands, donated by Dr. L. H. MacDaniels; 1000 plants from Palestine, donated by J. P. Young; 700 specimens in exchange with Wellesley College; 500 Nebraska plants, purchased from J. A. Bates; 300 plants donated by Dr. Anne E. Perkins. The housing problem for

the herbarium is exceedingly critical, but will be relieved when the plant-industry building is completed.

Dairy Industry

The number of students electing work in the Department of Dairy Industry has shown a gratifying increase. Registration in the elective courses in dairy industry and bacteriology given for four-years students increased nearly 50 per cent over that of the previous year, while the winter course in dairy industry showed a still greater increase. The winter course is meeting a definite demand from the dairy industry of the State, as is evidenced by the fact that of the total winter-course registration in the College of Agriculture more than 25 per cent was in the special dairy course. In addition to the increasing service to the State, the advanced courses given in the department are attracting the attention of workers in other parts of the world, as is indicated by the number of foreign students who are being sent here for higher study by various boards and foreign governments. During the past year there were, among the graduate students, European students under grants from the International Education Board, the Commonwealth Foundation, and the Ministry of Agriculture of England, and three Canadian students holding government fellowships.

Entomology and Limnology

The importance of work in entomology and limnology needs no comment. Damage caused to crops and to livestock by insect pests totals millions of dollars yearly. In the struggle against these pests in the State of New York, the Department of Entomology and Limnology of the College of Agriculture has contributed its share, in furnishing trained men and in the publication of numerous bulletins dealing with insects injurious to farm crops and stock and annoying to man. For more than fifty years entomology has been taught in the University and the College. The graduates are scattered the world over. In every State in the Union there are entomologists occupying influential positions who have received their early training in this department. It is particularly gratifying to note that, with but few exceptions, those so trained have remained true to their calling, continuing their work in biological lines as entomologists in experiment stations, as employees in the Bureau of Entomology of the Federal Government, as teachers in universities and agricultural colleges, as investigators in experiment stations, as county agents and assistants in the spray service; and far greater numbers, who have returned to the farms, have utilized in pest control their instruction in entomology as a phase of their course in general agriculture. This year, which represents a fair average of several years past, there are 73 graduate students enrolled in the department, of whom 33 are doing their major work here. Furthermore, there are 15 additional graduate students who were in residence during the summer months, and 20 others who at present are not in residence but who expect soon to complete their work. The work of these men, in both pure and applied entomology, benefits both the agriculture of the State and the broader agricultural interests of the Nation.

The instruction during the past year was embarrassed by the loss of several assistants, partly because they were able to command better salaries for similar service in other institutions. While a reasonable turnover in these positions is a benefit, when changes are made during the year it is very disturbing. If an assistant could be offered a slight increase in his second year, it might be possible to hold experienced men for longer periods.

The crowded quarters of the department do not afford satisfactory working conditions. Attention has frequently been called to the necessity of housing in a fireproof building the valuable insect collections and the entomological library, which are among the strongest and most valuable in the United States.

During the past year the working collection of insects has been greatly enriched, not only by insects collected in the State of New York but also by collections from the Western States by Dr. Bradley and others, and a considerable collection from British Guiana by Dr. Forbes and Dr. Babiý. Great progress has been made also in arranging the accumulated material, and in the interpolation of specimens which have been returned by specialists to whom they had been entrusted for identification. As an example of the way in which these collections grow from year to year, and as an indication of the nation-wide interest in these great collections, which is wholly incidental to their primary use by students in residence, the following summary report for the current year is appended:

The chief additions to the collections during the year are the following: (1) the Croissandean collection of Pselaphidae, 1500 specimens from all regions except the Palearctic, by purchase; (2) collections brought from the expedition to Surinam and British Guiana by Dr. Forbes and Dr. Babiý, including about 10,000 Lepidoptera, 1600 Orthoptera, 1000 Pselaphidae, 7500 specimens belonging to other orders, and from 20,000 to 30,000 specimens of unpinned material; (3) a considerable collection of all orders, but especially of aculeate Hymenoptera, collected by Dr. J. C. Bradley, J. D. Hood, and H. E. Guerlac in the Western States during the summer of 1927; (4) a small collection of wasps from Uganda, received in exchange; (5) a small collection of wasps from Paraguay.

The university collection of *Dasymutilla*, which has been in the hands of Professor C. E. Mickel, of the University of Minnesota, has been returned, and all data are included in Professor Mickel's monograph which has been published. This collection has now been arranged in our files. It contains many types, paratypes, and other material of the greatest value, and may be looked upon as one of the richest existing collections of the North American fauna of that large genus.

The collections of Membracidae and Cicindelidae have been entirely rearranged following the recent extensive material determined and returned by Dr. Funkhouser, of the University of Kentucky, and Dr. Walther Horn, of Berlin.

The following material has been lent to specialists during the year, for study in connection with monographic work that they have under way: 1075 bees of the genera *Angochlora* and *Agapostemon* to Miss Grace Sandhouse, of the United States National Museum; 750 aquatic Hemiptera to Professor Hungerford, of the University of Kansas; 1300 aquatic

Hemiptera to J. R. de la Torre-Bueno, of the Brooklyn Entomological Society; all our material of certain genera of Silphidae to Melville Hatch, of the University of Washington; 167 specimens of Ceuthophilus to T. H. Hubbell, of the Museum of Zoology, University of Michigan; 600 specimens of May beetles to Mr. Sin, of the Japanese Beetle Laboratory at Moorestown, New Jersey; 133 specimens of West Indian Vespidae to Dr. J. Bequaert, of the Division of Tropical Medicine, Harvard Medical School; 746 bees of the genus *Megachile* to T. B. Mitchell, of North Carolina State Agricultural College; 2100 Orthoptera to J. A. G. Rehn and Morgan Hebard, of the Academy of Natural Sciences, Philadelphia; 550 moths of the family Notodontidae to Dr. William Schaus, of the United States National Museum; 62 cicadas to William T. Davis, of Staten Island; 202 bees of the genus *Perdita* to P. H. Timberlake, of the Citrus Experiment Station at Riverside, California; 600 Membracidae to Dr. W. D. Funkhouser, of the University of Kentucky; all of our material of Anthidium and Stelis to Herbert Schwarz, of the American Museum of Natural History; about 5000 Neotropical ants to Dr. W. M. Wheeler, of Harvard University; about 250 Chrysididae to Dr. Trautmann, of Lantawerk, Germany.

Floriculture and Ornamental Horticulture

The year has been one of progress in the Department of Floriculture and Ornamental Horticulture, although certain handicaps have been met because of several changes in the personnel of the department, members of the staff having left to accept more remunerative posts elsewhere. There was an unusually large enrollment in the winter courses, and the new course for retail florists proved very attractive.

Of special importance was the appropriation, obtained on the initiative of nurserymen in the State, for enlarging and strengthening the educational and the research service to this very important industry. The resident instruction will be strengthened by additional courses dealing with the production and handling of nursery stock and the use of ornamental materials in landscape improvement. Provision for an investigator makes possible the development of a research program in ornamental horticulture, which hitherto has been largely unprovided. The College accepts these additions to its funds with enthusiasm, as it has long desired to deal more comprehensively with the field of nursery production and utilization. There have been demands from the industry for men with appropriate training, which the College has hitherto been able to meet only inadequately. The requests for graduates to fill important positions in both nursery work and floriculture have been greater than the supply. This is reflected in a substantially increased enrollment in the courses offered by the department. It appears that we shall soon find it necessary to limit the enrollment in certain of the courses in ornamental horticulture.

For several years both students and nurserymen have been asking for more work in landscape design as applied to the ornamentation of the farm home, the small suburban houses, and the rural public properties such as the school, the church, and the village squares. The golf associations also have turned to the College for enlargement of the instruc-

on in turf-making and lawn maintenance. The new funds now enable the College to go much further in the preparation of men for these special fields, and more especially with the instruction in ornamentation. Specifically, additional courses will be added in advanced plant design, landscape planning, recreation areas, the design of golf courses, the design and construction of small gardens and their color schemes, and the arrangement of garden material. The College of Architecture in the University is cooperating most helpfully.

Forestry

The following table shows the registration of students of professional forestry from 1912-13 to date. It is noteworthy that since the World War the number of professional students has steadily increased—from 42 undergraduates in 1919-20, to 125 in 1926-27. The total for 1927-28 is 117 in the first term and 115 in the second.

REGISTRATION OF PROFESSIONAL FORESTRY STUDENTS, 1912-13 to 1927-28

Year	Under- graduates only	Including graduates
1912-13	42	43
1913-14	60	65
1914-15	75	84
1915-16	76	80
1916-17	103	110
1917-18	44	46
1918-19	42	45
1919-20	60	63
1920-21	74	82
1921-22	88	93
1922-23	81	83
1923-24	94	98
1924-25	117	123
1925-26	127	133
1926-27	125	133
1927-28	117	123

The foregoing table includes only those who are specializing in forestry as a profession. In order to get the full picture of the instruction offered in the Department of Forestry, there should be added the large number of general agricultural students who enroll for certain courses in the Department, as, for example, the course having reference to the farm problem. Service to these students is one of the major functions of the Department. During the past year there were, in all, 623 registrations in the regular courses, made by 246 separate students; 19 registrations in the summer school; 28 in the summer camp; and 6 in the short winter course—making a total of 299, exclusive of duplicates. Two new features in the instruction of the professional students were introduced in 1927-28. In the autumn, through October and November, the entire senior class of thirty men was taken each week to the Arnot Forest for a full day of field work in silviculture, management, and utili-

zation. A part of the work included the felling and bucking-up of trees marked for removal in the permanent-growth study sample plots. The use of the Arnot Forest for instruction is one of the important services derived from this forest tract.

The second feature was a voluntary trip, taken by sixteen members of the senior class at their own expense at the time of the spring recess, to a forest tract on the coastal plain of South Carolina. The time was spent in studying yellow-pine logging, in making growth studies, and in gaining an acquaintance with conditions entirely new to most of the class. The trip will probably be repeated next year and may become a regular feature of the senior year.

The summer camp of 1927 was the most successful ever held. The party consisted of twenty-eight seniors, under the direction of members of the staff. The work began at Tupper Lake, where utilization was stressed in inspections of the operations of the Oval Wood Dish Company, in the woods and at the mill. The group then repaired to County Line Camp, near Newcomb, New York, where they found awaiting them the recently finished and commodious camp built especially for the use of this department, near the center of its extensive forest holdings, by Finch, Pruyn & Company, of Glens Falls. To the officers of that company the College is deeply indebted, not only for their generosity in providing the camp cabin, which is adapted in every way to the needs of the students, but also for the privilege of entry on any part of the company's forest. In 1928 the camp will be even more instructive to those who make up the party, in that the company is this year starting to log a section of forest in close proximity to the camp headquarters.

Four graduate students, candidates for the degree of master in forestry, worked under the direction of members of the forestry staff in 1927-28. Three of these men had completed their undergraduate studies at other universities. Three other graduate students, candidates for the doctorate but doing their major work in other departments, also took work with members of the forestry staff.

Of our graduates in forestry who took the United States competitive Civil Service examination in March for the position of junior forester in the United States Forest Service, three were selected for three of the four positions open at the federal forest experiment stations. As these are considered the most desirable of the entrance positions under the Forest Service, the result reflected favorably on the quality of instruction which our students receive. The fourth place was filled by the transfer of a man already in the Forest Service. The three Cornell men were assigned, respectively, to the Southern Forest Experiment Station at New Orleans, the Pacific Northwest Station at Portland, Oregon, and the Appalachian Station at Asheville, North Carolina.

The development of the Arnot Forest has proceeded satisfactorily. The first need was an exact boundary survey, as the outer lines had not been carefully rerun since 1820. The survey was nearly completed within the year. Work has been accomplished also in brushing out the old main logging roads and in protecting the roads in places from washing. Materials have been assembled for the construction of bridges over Jackson Creek, which flows through the forest. The forest was formally

"opened" by a field meeting held there on June 2, 1928. The pressing need in connection with this highly valuable tract is a fund for its development and management until such time as it begins to yield a return.

Following what has now become an established custom, a supervisor of a typical national forest on the Pacific Coast was sent to Ithaca by the United States Forest Service in February, to give a series of lectures on Forest Service methods of forest management and administration. The supervisor sent this year was David N. Rogers, of the Plumas National Forest, California; in 1927, A. G. Hamel, of the Superior National Forest in Minnesota, came to Ithaca. These gentlemen brought to the students much interesting material, and in group conferences put them in touch with the Forest Service point of view.

Professor John Bentley, jr., was on sabbatic leave during the year. He spent much time in examining the forests and forestry practices in Japan, the Philippines, Hawaii, and our own national forests in the West. In Japan and the Philippines his studies were greatly furthered by the special courtesies extended him by government officials. Journeys of this character greatly enrich the teaching materials and qualifications of the members of the staff. During Professor Bentley's absence the College was materially aided by the services of J. D. Kennedy, of the New York State Conservation Department, who was generously made available to the College for a period of four months by the Superintendent of State Forests.

Meteorology

The chief activity of the Department of Meteorology is teaching, and the interest of students in the field appears to be growing, as is revealed by increasing enrollments in the courses. The staff, consisting of a single professor and his assistant, is almost wholly occupied with the classroom and laboratory work, leaving practically no opportunity for extension teaching or research. There is little research under way anywhere on the agricultural relations of weather and climate, but the field is inviting. It would be desirable, if funds could be procured, to inaugurate a program of investigations dealing with the atmospheric environment of farm plants. Such studies would yield results of real significance to agricultural practice and crop adaptation. It has long been the desire of the College to inaugurate investigations in this field, since atmospheric conditions exercise a controlling influence on crop production.

Plant Breeding

In order to get through the year on the funds available, the Department of Plant Breeding found it necessary to curtail its experimental plantings. By agreement, the plantings of the several members of the staff were reduced by 10 to 25 per cent. This is exceedingly serious from the standpoint both of the scientific work and of the welfare of farmers, because of the highly productive value of this work. Of the wheat acreage of the State 90 per cent is limited to three varieties, of which two were developed at the College and the third was tested and recommended by the College; of the oat acreage, from 40 to 50 per cent is planted to

varieties developed and recommended by the College. Varieties of rye, corn, barley, and other crops developed at the College are coming into wide use. These more productive and resistant varieties add annually to the farm income of the State many times the total cost of the College to the people. It is of the first order of economy to sustain work of this character. Instead of curtailing the work, it would be financially profitable to the State to expand it so that additional crops, on which farmers are urging that work be done, can be taken up. There is very pressing need for increased maintenance funds for this department, among others.

Plant Pathology

It is probably fair to state that at no time in the history of the Department of Plant Pathology has its work gone forward with greater dynamic force and with more satisfactory results than throughout the past year. No setbacks due to loss of members of our staff have been experienced, and investigations furthered and brought to conclusion have been numerous and significant. A part of this encouraging situation has been due to progress made by an unusually promising group of graduate students, who, working under the direction of members of the staff, have conducted investigations of outstanding merit. It is felt, however, that the chief reasons for the gratifying results have been the better organization of the research, teaching, and extension work, based on a study of the needs in the field, the excellent spirit of cooperation within the department, and joint studies with workers in related fields. An earnest effort is being made to keep before the staff the problems in disease control of most importance to the agriculture of the State, and to approach these in the most direct manner. In many instances the direct approach is through a so-called fundamental or laboratory type of investigation, which on first inspection may appear to be foreign to the problem. The value of approaching fundamental studies through the applied field lies in the fact that this method not only leads to the solution of problems of economic importance, but also assures high efficiency and the maximum returns to the State for its investment. The extensive programs in research and extension are receiving constant study in order that the available staff and facilities may be used to best advantage. Teaching, both undergraduate and graduate, has been ably handled and made increasingly effective.

Instruction has been offered in fourteen courses, including three in the Summer School of Biology and one in the winter course. The total number of registrations was 241, which taxed the inadequate housing and laboratory facilities to the utmost and was more than could be handled to best advantage. Of the 241 registrations, 199 were in the regular undergraduate and graduate courses, 10 were in the Summer School of Biology, and 32 were in the winter course. The winter course was given to one of the finest groups of students we have had in years, and offers encouragement for the usefulness of the short courses. The majority of these winter-course students were interested in the diseases of greenhouse crops.

Of graduate-student registrations, there were 12 in the summer of 1927, 40 in the fall semester, and 37 in the spring semester, making a total of

89. During the year, 12 new graduate students registered for major or minor work in plant pathology. There were 30 graduate students taking majors in the department, 28 of whom were registered for the degree of doctor of philosophy. In addition, there were 15 students with minors in plant pathology, and continued contact was maintained with 7 major students who during the past several years have left the institution to accept positions elsewhere but who plan to return to receive their degrees.

Plant diseases continue to take heavy toll from our important crops. The control of wheat diseases in 1926 would have added 386,000 bushels to the New York State yield of 4,887,000 bushels. In the same year, 324,000 bushels of barley (production 5,066,000 bushels), 3,007,000 bushels of oats (production 34,578,000 bushels), 601,000 bushels of corn (production 23,450,000 bushels), 14,749,000 bushels of potatoes (production 29,011,000 bushels), 107,000 bushels of beans (production 1,145,000 bushels), 1,683,000 bushels of apples (production 40,375,000 bushels), and 47,000 bushels of peaches (production 2,300,000 bushels), were lost due to diseases. (These figures are taken from *Plant Disease Reporter*, U. S. Dept. Agr., Supplement 56, 1927.) Figures for other crops are equally striking. Similar losses occur annually, and in years when the important diseases occur in epiphytotic severity the losses are much larger. Many of these diseases are controllable, at least in large part, by methods known to be practicable and available to farmers. In others of the diseases additional investigation is needed. The problem of increased production from crop-producing areas increases directly with increased population, and competition demands the highest yield per unit of land and labor. It costs but very little more to produce 400 bushels of potatoes per acre than to produce 100 bushels, which is nearer the average for the State; and when the difference is due to losses caused by diseases and insects, which is generally the case, the difference in cost of production for the two yields is negligible. In these figures and similar ones which may be had, is to be found the basis for the request for increased support of the work in plant pathology.

In the report of last year, the limits imposed on the department through inadequate support were pointed out. The situation as outlined has not been changed. Everything possible should be done to expedite the construction of the plant-industry building, since the present quarters are unbearable. Under existing conditions the best teaching is impossible, and the research suffers because of the lack of equipment for which there is no available space even if funds were available for its purchase. A staff well trained to use modern—that is to say, chemical—methods in attacking plant-disease problems is working under the handicap of having practically no equipment for such work. The offices are damp, poorly lighted, and inadequately equipped with desks, filing cases, and other furniture, and, like the laboratories, are overcrowded.

The present inadequate quarters are deteriorating rapidly, since the construction evidently was not intended for such use as has had to be made of it. Large areas of the flooring will need to be replaced this summer, and all of it will soon be worn out. The plumbing is showing signs of giving way. Unless the new building is constructed with all possible speed,

the State must soon be put to the additional and heavy expense of re-fitting quarters which are unsuited for anything other than cloakrooms and storage facilities.

Thought must soon be given to increased greenhouse space and facilities. Both teaching and research require additional space. Certain pieces of apparatus, such as a series of temperature chambers for soil-temperature control and a series for air-temperature and humidity control, both to be housed in and used in connection with the greenhouses, are needed.

The teaching and research of the Departments of Botany and Plant Pathology have increased beyond the point where one gardener or greenhouse man can handle all of the work. The result is that the technical staff finds it necessary to do most of its own planting and take care of its plants, which means that the State is paying more than it should for this kind of work, and the plants are not properly cared for because of other duties of these more responsible persons. The solution is a division of the work, with a full-time man assigned to each department.

A suitable area for experimental plantings, together with funds for miscellaneous labor to enable the department to conduct field experiments at Ithaca, would add greatly to the research. The department never has had support for this kind of work, and the situation would have been almost hopeless but for the special temporary fellowships granted by growers' organizations and commercial companies.

Certain increases in the staff for teaching, extension, and research, together with promotions in salary and title, are desirable. The direction of the work of the special field assistants, an important phase of the extension service, should be in the hands of a full-time worker of the grade of assistant professor. A worker well trained in chemistry, a cereal pathologist to cooperate with investigators in plant breeding as well as to attack cereal-disease problems of the State, a mycologist to strengthen the work in the physiology of the fungi and to investigate certain phases of storage- and transit-disease problems, and a curator of the herbarium, are all needed additions.

There should also be added a scientist to give full time to a study of diseases of florists' and ornamental crops. The value of the cut-flower and potted-plant industry in New York State amounts to \$75,000,000 yearly. Further, as a result of the plant-quarantine laws a large industry of growing bulbs and certain other plants for forcing and nursery use is having a rapid development in the State, especially on Long Island. Methods in practice in Europe are being transplanted along with the industry, which means that, in addition to the normal losses from disease, trouble will arise from the scarcity of cheap and skilled labor in this country. The call for assistance on plant-disease control has already arisen, and we should anticipate the certain need for help by undertaking studies at this time. At least two States, New Jersey and Ohio, now have full-time investigators on diseases of ornamentals.

It is hoped that in the extension work more time can be given to making a rather careful plant-disease survey each year. Such a survey not only keeps the college workers in touch with the prevalence of diseases and losses — often unknown to the farmer, who may not realize that decreased yields and quality are due to disease — along with the possible entrance

and establishment of new pathogenic organisms in our crop areas, but also provides a sound basis for the extension program for the following year. Such limited crop surveys as the College has made, mostly on funds other than state funds, have been very valuable but they are insufficient.

One additional item may be mentioned. The employment of non-technical assistants as a means of materially increasing the productiveness of the present staff, at a relatively small investment, deserves careful consideration. Highly trained men are giving too much time to routine duties which could be handled by non-technical assistants. Because of the direct financial value as well as the economic necessity of reducing losses from diseases, the staff and facilities of this department can be materially enlarged before the point is reached where the expediency of further expansion may be justly challenged or the question of maintaining proper balance raised. Returns to the State for its investment in plant-disease control are large. The employment of non-technical assistants, together with suitable housing and adequate equipment for offices and laboratories, offers relatively high returns for the investment.

Pomology

Many students in agriculture find it impossible to stay throughout the four-years course, but they may nevertheless desire to take, among other work, courses in fruit growing early in their college career. Hitherto it has not been possible to take such work in pomology until the spring term of the second year. Adjustments have been effected for offering the prerequisite work in botany in the first term of the freshman year, so that the student may now obtain the introductory course in pomology in the second term of his freshman year.

The enrollment in the general and elementary courses offered by the Department of Pomology is usually large enough to justify offering the introductory course each year. In the case of the advanced work, however, it appears desirable, in the interest of economy and efficiency, to offer certain courses in alternate years only. The professor's time thus conserved is devoted to the departmental research activities. Since the student can now begin the pomology work in his freshman year, this now becomes possible.

With the object of improving the teaching methods, there is now under way a "job analysis" of the various occupations which are taken up by those who have had work in pomology. It is hoped that such a study will indicate modifications or shifts of emphasis that may be needed in the courses offered by the department, and in the curriculum suggested for specializing students in order that they may be better fitted for their life work.

Among the needs that have already been mentioned in previous annual reports, the following items seem especially important: (1) a well-trained biochemist to help in the chemical phases of the research on the nutrition of fruit plants; (2) several technical assistants; (3) a mature orchard for experimental purposes in a good fruit section, under absolute control of the College; (4) storage space for spraying outfits and other orchard implements. These needs should receive consideration whenever the

means can be provided, in order that our work can be carried on most effectively and be of greatest service to the State.

It is a pleasure to record the fact that the staff remains intact, even though in the past year three members have had tempting offers to go elsewhere and to assume important posts at higher salaries than they are now receiving. It is to be hoped that the personal financial sacrifice involved may be offset in the very near future.

Poultry Husbandry

In extension of the courses previously available, there was offered during the past year advanced instruction in feeding poultry and in marketing poultry products. During the year, 11 graduate students took work in the department. In addition to the usual poultry short course, in which 12 students were enrolled, two one-week schools were held during the year. The tenth annual poultry-judging and -breeding school was held during late June and early July, 1927. There were 89 persons in attendance, representing sixteen States and five foreign countries. At the second annual poultry- and egg-marketing school, held during the week of November 28, 1927, there were 25 persons in attendance, of whom 16 were inspectors of the New York State Department of Agriculture and Markets.

Rural Education

As a comprehensive report of the organization and work of the Department of Rural Education has not previously been included in the annual report of the College, a somewhat extended statement is presented here. This is especially appropriate because of the rising interest in this field of college work. The service of the department is organized to meet most of the major aspects of rural and agricultural education and the preparation of teachers of vocational agriculture and home economics.

Service to rural elementary-school teachers

For teachers of experience who are not college graduates, the department offers in the Summer Session a series of courses that may serve for professional improvement. During the Summer Session the department also maintains a demonstration school of rural type at Forest Home, near the campus, which is used for the observation of teaching in the elementary studies. Members of the departmental staff from time to time take part, when invited, in teachers' conferences about the State. The professor in charge of science teaching and nature study has considerable correspondence with elementary-school teachers in service, growing out of the use of the Cornell Rural School Leaflets. These Leaflets, dealing largely with nature study, are sent to all elementary-school teachers in New York in districts having less than 4500 population. They furnish a basis for much of the nature work in the schools. The professor in charge of science teaching and nature study has published in the *Nature Almanac* for 1927 a survey of nature education in the United States. He edits a section of the *Nature Magazine* devoted to nature education. In so far as these publications are accessible to rural elemen-

tary-school teachers, they serve as a means of contact with the department. Several studies by graduate students having more or less direct bearing upon the problems of the rural elementary-school teacher have been undertaken.

Service to rural secondary-school teachers

(a) Teachers of agriculture. This department is the primary agency for the professional preparation of teachers for high-school departments of "vocational agriculture" in New York, and it offers courses for both undergraduates and postgraduates, both during the academic year and in the Summer Session. The department cooperates with the high school at Trumansburg, New York, eleven miles from Ithaca, in providing facilities for observation and practice in its department of "vocational agriculture." The teacher in that department is a member of the Department of Rural Education at the College, drawing his salary from the College as of the rank of instructor. He acts as critic and supervisor of practice teaching, under the direction of the professor in charge at the College. A minimum of thirty half-days of observation and practice is required of every prospective teacher of agriculture. In the summer, observation of the supervised farm practice of the boys in the school at Trumansburg, and also in the schools at Odessa and Geneva, New York, is a part of the instruction. The department employs an instructor to give most of his time to itinerant service to teachers of agriculture who are graduates of the department. In addition the professor in charge makes occasional visits to teachers of agriculture in New York, and usually participates in the regional and state conferences of such teachers. Members of the staff have, from time to time, published articles in the *Agricultural Teachers' Bulletin*, a paper issued irregularly by the Association of Agricultural Teachers in New York. The Federal Board for Vocational Education has published two bulletins of interest to high-school teachers of agriculture, prepared by members of the staff of the department. Every year members of the staff direct researches of interest to teachers of agriculture, through graduate students. Studies such as can be followed without extensive absence from the College are undertaken also by members of the staff. A considerable number of completed studies in the form of theses of graduate students are in the college library.

(b) Teachers of home economics. The department provides professional preparation for teachers of home economics in the vocational departments of high schools in New York. It cooperates with the high schools at Trumansburg and Groton, New York, in the maintenance of facilities for observation and practice in the teaching of home economics. In the vocational department of each of these schools it employs a teacher, with the rank of instructor in the College. She acts as critic and supervisor of practice teaching under the direction of the professor in charge at the College. A minimum of twenty half-days of observation and practice is required of every prospective teacher of home economics. In addition, from two to four observations in the Ithaca High School are required. Every student-teacher is required to direct the work of one

pupil in home projects. Graduates of the State College of Home Economics frequently obtain positions in junior high schools, where the problems of teaching are somewhat different from those in the senior vocational departments. The professor in charge is accustomed to make from six to twelve visits annually to teachers of home economics who have studied in the department in the class of the preceding year, as a means to itinerant service in the improvement of teaching. Very few graduate students have undertaken studies in professional fields of home-economics education with the department. One graduate student has completed a thesis on the difficulties of student-teachers.

(c) Teachers of science. There have been enrolled annually in the department students preparing to teach science in the smaller high schools, largely in rural centers. Courses useful to such students are offered. Some observation, without personal supervision by the professor in charge, is permitted in the Ithaca High School, by the courtesy of the superintendent and the principal. The professor in charge of science teaching and nature study usually attends and takes part in the sectional meetings of science teachers at general meetings of high-school teachers about the State. The instructor in charge of itinerant teacher-training in agriculture deals with a number of teachers of agriculture who also teach science. The Cornell Rural School Leaflets are sent to all teachers of science in high schools of districts under 4500 population in New York. At a small additional expense the service could be extended to teachers of science in the larger school districts. Graduate students have undertaken as thesis problems several studies bearing upon the problem of the high-school teacher of science.

(d) Other teachers in rural high schools. The department has, among its offerings, courses presumably of some use to other teachers in rural high schools, prospective or employed. The College is rather well equipped to contribute to the preparation of teachers of social science, especially in its rural phases, in the smaller high schools.

Service to teachers in normal schools

(a) Trainers of rural teachers. Graduate students of the department have gone out to work in normal schools and teachers' colleges, as instructors in rural education. Several graduate students are in residence each year who are looking forward to such positions. There appears to be a movement to develop these positions. Courses, on a graduate basis, pertinent to the needs of such students are offered. One or two observation trips during the year are made to the Cortland Normal School. In the summer, observation of teaching and of the supervision of teaching is permitted at the school in Forest Home, near Ithaca. Several research studies on pertinent subjects, in the form of graduate students' theses, have been completed.

(b) Teachers of biology and nature study. The College is well equipped for the preparation of teachers of biology and nature study in normal schools and teachers' colleges. The department enrolls students looking to such positions. It offers courses more or less definitely in line with their needs. Students of nature-study methods often serve as

sellors in summer camps. The professor in charge of science teaching and nature study visits normal schools every year to assist teachers in nature study. The Cornell Rural School Leaflets are now supplied to teachers of science and nature study in the normal schools of New York, and they are extensively used by such teachers. The professor in charge of science teaching and nature study published a study of nature education in the normal schools of the United States in the *Nature Bulletin* for 1927, and he is an extensive contributor to periodicals used by such teachers in the normal schools. One thesis for the doctor's degree is under way, dealing with problems of nature study in normal schools. The Pack fellowships are designed to aid investigations such as may be helpful to teachers of nature study and biology in these schools.

Service to teachers in land-grant (agricultural and home economics) colleges

(a) Teachers of agricultural subjects; (b) teachers of home-economics subjects; and (c) other subject-matter teachers. A large number of graduate students go out from the State Colleges of Agriculture and Home Economics each year into teaching positions in the land-grant colleges. In addition, many members of the resident staff of the two colleges at Ithaca have displayed an interest in the improvement of their college teaching methods. Indeed, the offering of special work for these groups was stimulated by the desire of the general staff of the two colleges at Ithaca to improve their methods of teaching. In an attempt to meet this situation, the department offers courses pertinent to the needs of such persons. Members of the staff of this department are called upon to advise with teachers in the two Colleges. Occasionally, they make visits to classes in other departments for purposes of advice and criticism. A report on the status of teaching in the two Colleges, prepared by a member of the staff of this department, has been distributed to the staffs of the two Colleges. A member of the staff devoted the spring semester of 1924 to a study of teaching in the College of Agriculture (then including the College of Home Economics). The completed study is on file in the library in mimeographed form. A graduate student has completed a doctor's dissertation on the problem of selecting content for a course in dairy husbandry. This also is available in the college library.

(d) Teachers who prepare prospective teachers of agriculture in the secondary schools (the so-called "teacher trainers"). A large proportion of those engaged in teacher-training in agriculture acquired their professional preparation at the New York State College of Agriculture. Every year there are a number of men engaged in that work, or looking forward to it, enrolled as graduate students in the department. Observation of the work in teacher-training in the high school of Trumansburg has been utilized. It has been the custom to unite the supervisors and the teacher trainers for observation trips to Trumansburg, Odessa, Geneva, and other schools in New York. A trip of a week to schools in other states has been a required part of the course work in the regular year. Members of the departmental staff attend the regional conferences called

by the Federal Board for Vocational Education in the northeastern States. That Board has published several bulletins and circulars of interest to teacher trainers in agriculture, prepared in part or in whole by members of the staff of this department or by graduate students working under their direction. A considerable number of studies bearing on the work of teacher-training in agriculture have been completed in the form of theses or reports by graduate students under the direction of members of the staff, and others are under way.

(e) "Teacher trainers" in home economics. It is still somewhat difficult to find persons qualified on both the professional and the technical side for the preparation of teachers of home economics for the secondary schools. Courses are offered for persons who wish to qualify professionally for this important field of education. For these persons some observation of the work of critic teachers at Groton and Trumansburg is provided, and some participation is had in the work of the critic teacher. The professor in charge of the training of teachers of home economics attends the regional conferences of teacher trainers and supervisors called by the Federal Board for Vocational Education in the northeastern States.

(f) Teachers of rural education (general, elementary, secondary). The employment of teachers of rural education in colleges, especially agricultural colleges, is on the increase. Every year there are graduate students enrolled in the department looking to such employment. A number of research studies indirectly contributing to help college teachers of rural education have been completed as graduate theses, and others are under way.

(g) Teachers of methods of science and nature study. The employment of teachers of methods of science and nature study is on the increase. Every year inquiries come from various States asking for assistance in this field. These demands are largely from prospective graduate students. Courses offered by the department are useful for persons seeking preparation for these fields.

Service to teachers in cooperative extension work in agriculture and home economics

(a) College specialists in extension. The State Colleges of Agriculture and Home Economics employ a considerable number of extension workers. Every State in the Union has many such workers. Most of them are without professional preparation in methods of teaching. There is evidence in recent years of growing interest in the professional side. For several years, persons thus employed have enrolled in the department for professional work, usually as a minor subject to some major in the field of technical agriculture or home economics. A considerable number of graduate students go into such work every year from this institution. The department is now giving special attention to their needs. Thus far, observation and practice have consisted almost wholly in method teaching by members of the class. On two occasions a specialist has invited the group to observe and criticize his teaching in a near-by community. Observation during Farm and Home Week has been regular.

employed. Members of the departmental staff have given much time to conferences of extension specialists and to advising with individual specialists.

(b) County agents in agriculture, home economics, and boys' and girls' club work. A very considerable interest in the professional equipment of county agents has developed over the country. In the State Colleges of Agriculture and Home Economics here, curricula have been worked out for the professional preparation of such agents. At present, however, the requirement of professional equipment is not strictly demanded for appointment, so that the number of students undertaking preparatory work has been small. There is much to be said for the view that professional work should be in addition to four years or more of technical preparation in the subject matter of agriculture and home economics. Experienced agents have from time to time, particularly since the special courses have been offered, enrolled in the work of the department. With the agricultural group of undergraduates a small amount of observation and some moot practice have been undertaken. With the undergraduate group in home economics, each girl is actually responsible for, and carries through, extension teaching on several occasions with a group of country women. The graduate group has the same observation and moot practice as the specialists above mentioned. Members of the departmental staff frequently have a part in the conduct of conferences of county agents. The Cornell Rural School Leaflets are sent to all county L-H Club agents, and on request to most local leaders of boys' and girls' L-H Clubs. Graduate students have completed theses in three cases bearing on the work of county agents. A tentative analysis on the basis of a field survey of the educational responsibilities of the county agricultural agent has been prepared by the professor in charge. A graduate student is working out a doctor's dissertation on the same problem. A temporary allotment of funds from the General Education Board makes it possible to aid financially the work of graduate students in research in this particular field for the coming year. The professor in charge has spent one semester in the field in observation of all phases of extension teaching.

Service to supervision and administration

(a) Principals of rural schools. Agricultural-college graduates, particularly those who have prepared for the teaching of agriculture in the smaller high schools, are more and more frequently becoming principals of centralized rural schools, including both the elementary and the secondary grades. A considerable number of graduates from this department occupy such positions. The trend, too, is toward professional qualifications of a graduate level for principals, following undergraduate preparation for teaching and experience in teaching. The department offers courses which are appropriate to meeting these conditions. Members of the departmental staff attend the state meetings of secondary-school principals and the convocations at Albany. The professor of rural secondary education visits from eight to ten principals each year to give them professional guidance. Members of the staff concerned with agriculture and home economics confer with principals in relation to teaching in

those fields. A few graduate students are conducting investigations of interest to rural-school principals. With the aid of funds furnished from outside the College, the professor in charge of rural secondary education has completed two studies of rural secondary schools. As chairman of a national committee on small high schools, he is engaged at present in an investigation which is nearing completion.

(b) Superintendents of rural-school systems. The movement to advance the standards of professional qualifications of rural-school superintendents is well under way in New York and other States. The College has resources for instruction of the desirable type for these persons. There is already some evidence of appreciation of the opportunity here, on the part of experienced superintendents who come for the work. At present, graduate students are finding an opportunity for observation and practice in the Tompkins County survey now in process. The department has offered correspondence courses, without credit toward a degree, for superintendents. It has also, for several years, conducted a week of short-course instruction for superintendents, at which a few have enrolled. During Farm and Home Week it is accustomed to place in the program a meeting for school superintendents. Members of the staff have frequently taken part in teachers' meetings about the State, at the behest of the district superintendents. They also make occasional visits to superintendents, on request, and travel with them in their work in an advisory capacity. One extension bulletin on rural-school buildings has been published by the College and distributed to the district superintendents of New York. Several investigations of problems significant to good rural-school administration have been completed by graduate students and members of the staff.

(c) Rural-school supervisors (of agriculture, of home economics, of science, nature study, or rural elementary education, and of county extension work). Of supervisors of agriculture employed in the United States a large number have studied in the department here. Each year a number of such men, either already employed or designated for employment as state supervisors, assistant supervisors, or district supervisors, enroll for work in the department. Observation trips to schools at Trumansburg, Odessa, and Geneva are made during the school year and in the summer. In May a trip of seven or eight days for observation of schools elsewhere in New York and in two or three neighboring States is provided. At such times students meet the supervisors of agriculture for discussion of the problems of administration and supervision. As a rule, the supervisor joins the group in the trip through his State. Members of the staff attend the regional conferences of state supervisors and teacher trainers called by the Federal Board for Vocational Education, and occasionally meetings of the agricultural-teaching sections of the American Vocational Association and the Land-Grant College Association. The Federal Board for Vocational Education has published several research studies by graduate students working under the direction of the department, and by members of the staff. Several States also have published as bulletins some of these studies. Every year graduate students have undertaken studies of problems in the field of administration and supervision of agriculture for secondary schools. One member of the staff has made an extended

study, which was published in the report of the Rural School Survey of New York. Another member has made an intensive local study, which is not yet published in widely available form.

To meet the needs of persons seeking equipment for service as supervisors of home economics, the department offers courses more or less pertinent to their requirements. Some observation of the work of student and critic teachers in the schools at Trumansburg and Groton is provided, and permission is given for observation in the Ithaca public schools also. The professor in charge attends the regional conferences of supervisors and teacher trainers called by the Federal Board for Vocational Education.

Graduate students have gone from the department to employment as supervisors of science, nature study, or rural elementary education, particularly in the field of nature study. In most years, especially in the Summer Session, students have been enrolled who are either already employed in such work or are looking forward to it. The professor in charge of science teaching and nature study meets annually with the National Council of Supervisors of Nature Study and Gardening. The Cornell Rural School Leaflets are now available to supervisors of nature study in the State of New York. The expense of supplying the Leaflet to the two-hundred-odd supervisors of science or nature study in the United States would not be great, but funds are not now available for this purpose. The professor in charge of science teaching and nature study made a survey of the work of supervisors in these fields for the United States, and published it in the *Nature Almanac* for 1927.

Every State in the Union employs persons engaged in the supervision of county extension work in agriculture and home economics, in the three phases for men, for women, and for girls and boys. In the past two years, seven such persons have come to Cornell for study and have enrolled for professional work in the department. These men and women have had the same observation and practice in moot teaching as have the extension specialists and the county agents. Mimeographed copies of an analysis of the work of the county agricultural agent have been sent to a considerable number of supervisors of extension. Two studies bearing upon the work of the county agent have been completed by graduate students, in the form of theses. Another is under way.

Service to lay interests

Every graduate of the State Colleges of Agriculture and Home Economics is likely to have the interest and the responsibility of the parent and the citizen in matters of education. He or she may be able to effect intelligent leadership in his community in such matters. In view of this, the department has offered for undergraduates a course entitled "Introduction to Problems of Public Education." Members of the departmental staff are often called upon to take part in meetings of parent-teacher associations, scout organizations, child-study clubs, school trustees, school boards, granges, home bureaus, and the like. Occasionally they find time to do so. One bulletin on school buildings has been published by the College and is available to laymen interested in the problem. The professor in charge of nature study is a frequent contributor to periodicals

useful to lay interests and supported by them. One study of the work of parent-teacher associations, supported by funds from the General Education Board, has been completed by a member of the staff and published in book form. The professor in charge of nature study has completed and published a survey of the work in nature study in camps for girls and boys. At this point it is pertinent to call attention to a very real opportunity which has become available for the next two years through the generosity of the Charles Lathrop Pack Forestry Trust. This Trust, through its trustee, Captain Arthur Newton Pack, has given Cornell University \$6000, available for two years, to provide each year two or more graduate fellowships to encourage research and higher training in methods and practices affecting the education of the public in the use of its natural resources. Specifically, through the training of specialists and through research and contact with teacher training centers, it is the purpose to further nature education and forestry and the appreciation and use of our natural resources by the people. These Charles Lathrop Pack fellowships in nature education and forestry are available to persons who already have at least the equivalent of a master's degree and who wish to go further in these fields. They meet a real need at the present time.

Through the Division of Education of the University, the Department of Rural Education in the College of Agriculture cooperates with the Department of Education in the College of Arts and Sciences, so that courses in the history of education, the principles of education, and other such subjects, become available to students in the State Colleges of Agriculture and Home Economics. In such cases as the certification requirements for teaching indicate, or otherwise as it seems desirable, those courses are included in the programs of students in rural education. The department is also charged with the teaching of psychology and the direction of the work in mental testing for the Department of Child Guidance in the State College of Home Economics. It is charged further with the teaching of psychology to students of hotel administration in the College of Home Economics.

Special features

Itinerant teacher-training with the teachers of vocational agriculture in the high schools of the State, a plan for which was begun eight years ago but was disrupted by the resignation of Professor W. F. Lusk, was provided for, beginning with the second semester of 1927-28, by calling E. R. Hoskins, of the Trumansburg department, for the work. According to the present plan, Mr. Hoskins will continue his connection in an advisory capacity with the Trumansburg department and will assist in the program of directed teaching at Trumansburg, at least sufficiently to coordinate the training program with the needs of agricultural teaching as indicated in the field. The major part of his time will be given to assisting the less experienced teachers in service in meeting the problems which arise—a service which this College is able to render, and which the Division of Vocational and Extension Education of the State Department of Education has for several years been urging the College to render. The

itinerant teacher-training program furnishes an excellent opportunity for state-wide cooperation. It gives the staff members who conduct the special training an avenue of contact with the problems of the State on the one hand, and a channel of service for the College on the other. Although accomplishing a much-needed service, it has drawn some of our general-staff resources away from the resident training program, which leaves a relatively too heavy teaching load for the members of the staff concerned with agricultural education.

A feature of the training program for teachers of agriculture, which was begun by the professor in charge a few years ago, has not only become established here but is attracting considerable attention elsewhere. The plan involves the centering and organization of the special- and general-methods study in the problems that grow out of teaching. Such theory as may be needed for elaborating a point is brought into the program as need for it arises. This program gives emphasis to a program of supervised practical work on the part of student teachers. The feature is discussed in the report of the eleventh annual North Atlantic Regional Conference, held at Boston, February 22 to 25, 1928, published by the Federal Board for Vocational Education.

A short course in principles of method for rural-school teachers of Tompkins County was given during the winter, in response to urgent request from the three district superintendents of the county. It ran from October 22, 1927, to February 25, 1928, meeting on Saturday mornings.

A parent-teachers' institute was held at Ithaca on May 7 to 11, 1928. This was planned in direct response to request by the New York State Parent-Teachers Association, following a similar institute in 1927. The general theme of the institute was how the parent-teacher association may aid the development of the child through an understanding of the curriculum.

The department has assisted in five two-days conferences of district superintendents in as many different parts of the State. These conferences are called yearly by the State Department of Education. Members of the staff have assisted in other years.

Rural Engineering

With progress in knowledge and experience on the one hand, and changes in farm requirements on the other, there is need for frequent adjustment in the selection, arrangement, and method of presentation of materials used in instruction in the several fields included within the Department of Rural Engineering. In view of the rapid increase in farm power lines, a much-needed development, there has come increased interest among both farmers and students in the applications of electricity to farm use. This has been reflected in larger provisions for instruction in electricity and its applications in agriculture and the farm home.

In addition to the regular offering in the winter courses, an innovation was instituted this year for the purpose of rendering a more specific and personal service. Opportunity was provided, for all who wished to do so, to bring to the College farm equipment in need of overhauling, and to repair it in the farm-mechanics shops and laboratories. The work was

done by the students themselves under competent supervision, and explanations of needed principles and practices were given as the work progressed. Necessary assigned collateral reading was done by the students in the evenings. Attendance could begin or end at any time during the winter-course term. The attendance last winter was 9 students. The small number was probably due to the fact that announcement of the course was made late, after the regular program had gone out. Two tractors, a grain binder, a drill, and other smaller equipment, were overhauled and considerable allied laboratory work was undertaken. The plan seems essentially a good one and the offering will be repeated.

There were 6 graduate students registered with the department, of whom 2 were taking their major work and 1 was taking minor work for the doctorate, and 3 were taking their major work for the master's degree. The interest in graduate work in this department seems to be increasing, as the position which rural engineering must hold in the great transition that is taking place in the agriculture of the Nation becomes more apparent.

The department is in sore need of suitable housing and increased funds for equipment and supplies. Farm machinery is a major interest of farmers, and every year its importance increases with the declining availability of employed labor. Furthermore, it is undergoing constant change and adaptation, necessitating frequent replacements and additions in the departmental property if the college teaching is to keep in step with progress. As farm machinery is relatively expensive, the very limited funds available for its purchase by the department imposes a severe and embarrassing limitation. In addition to present resources, funds should be available every year for the purchase of a tractor and other equipment which may be put to work on the college farm and worn in service, in order that accurate figures as to use, maintenance, and upkeep under accurately controlled conditions may be secured.

Farm machinery is bulky, and adequate facilities for teaching require that many types suited to various uses be available. The State has never made provision for housing this department. As it cannot appropriately be housed with other departments because of the nature of its laboratory work, it is highly important that a special laboratory building be erected. This is a need of long standing.

Rural Social Organization

The increase in the number of students enrolled has been the most notable development of the work of the Department of Rural Social Organization during the past year. The following table gives the total enrollments in courses offered in the regular academic year and in the Summer Session in Agriculture, from the beginning of instruction in this field to the present time. The most significant facts are that the number of undergraduates in the academic year, now 194, has nearly or more than doubled in each of the past two years, and that the number of graduate students in the academic year, now 66, has doubled in the past year. The number of courses offered has doubled in the past two years.

STUDENT ENROLLMENTS IN RURAL SOCIAL ORGANIZATION, 1918-19 TO 1927-28

Year	Academic year		Summer Session		Total
	Under-graduate	Graduate	Under-graduate	Graduate	
1918-19.....	25	3	.....	.....	28
1919-20.....	45	7	30	6	88
1920-21.....	29	6	10	5	50
1921-22.....	37	19	70	9	135
1922-23.....	58	19	4	9	90
1923-24.....	47	31	5	9	92
1924-25.....	42	39	97	9	187
1925-26.....	41	34	114	16	205
1926-27.....	79	33	204*	15	331
1927-28.....	194	66	120*	14	394

* Includes 50 students in the course in general sociology offered for both Colleges—Agriculture and Home Economics.

The student enrollment in the Summer Session increased in 1924 with the increase in the number of courses offered. The increase of students during the past year has been chiefly in two foundational courses, namely, the course on the family and the course in general sociology. The course in general sociology given in the Summer Session by the College of Agriculture has registered 50 students in each of the past two years. This is evidence that there is a real demand for work in general sociology in the Colleges of Agriculture and Home Economics.

There appears to be need for the addition of an orientation course which would be an introduction to the social sciences. The freshman orientation course now available to all students in the College gives a general outline of the work of the College from the standpoint of vocational interests. There is a real place, however, for a course which would give an introduction to social science to students who expect to specialize or to take considerable work in any of the departments dealing with the human side of rural life, such as rural education, agricultural economics, home economics, extension teaching, and rural social organization. With the growth in numbers of students registering, this course and the course in general sociology would require an additional assistant professor, and the need for such an addition to the teaching staff is already felt.

It is difficult to accurately evaluate the results of teaching, because of the widely varying activities and geographic distribution of students after graduation. It is apparent, from our experience and from the testimony of students who have taken the courses and of extension officials, both state and county, that a good knowledge of the fundamentals of sociology and of rural social organization is essential for the training of extension workers, and that those now engaged in extension work feel their lack of this training. Social science is now being introduced into rural high schools, particularly in teacher-training courses, and a number of teachers of these courses are coming to the College for training. Finally, it becomes increasingly evident, from the attitude and interest of the students, that, with the growing complexities of modern life, they have a very definite

and concrete interest in both economic and social problems, and that courses in these subjects appeal to them because they help them in shaping a more adequate working philosophy of rural life. This is particularly true of work in general sociology and rural social problems, which reveals to them the influence of custom and tradition, how group life affects the behavior of individuals, and the interrelation and functions of various groups and organizations, and gives some introduction to the phenomena of rural social psychology. During the past year the instruction in the social psychology of rural life has been strengthened by the addition to the staff of Dr. Robert W. Nafe, who devotes his time exclusively to research in this field and to teaching two courses in the second semester.

During the past year there were 80 course enrollments of graduate students. Of these graduate students, 24 were taking courses in the department as majors or minors for a degree as compared with 13 in the previous year. Of these persons, 5 were taking their major work for the doctor's degree, and 3 for the master's degree, in rural social organization.

There is an increased interest in graduate work in this department due to the appropriation of funds under the Purnell Act for research in rural sociology, because of the need which extension workers have for graduate training in this field, and because of the recognition by those taking graduate work in rural education of the value of the application of sociology to educational objectives, methods, and administration. Since graduate work involves much individual conference, the pressure on the staff of the department is becoming very heavy. In total, 130 recorded individuals have pursued graduate work in the department during the past ten years. Those whose present residence is known to us are located in twenty-seven States and six foreign countries, including 7 persons in China, and are in positions of responsible leadership on college and university faculties, in educational administration, in extension work, or in secondary schools. Four of the men who have completed their work for the doctor's degree are in university teaching and research work in rural sociology, and two of them are authorities on the farmer's standard of living and have done outstanding research work on this subject.

Vegetable Gardening

Enrollment in courses in vegetable gardening during the year 1927-28 showed a substantial increase over that of the preceding year. Most of this increase was in the regular courses given to four-years students. There were 104 registrations in the department, of which 81 were in the regular courses, the others being in the summer school and the winter courses. In addition, 5 graduate students conducted research on their major problems under the direction of members of the staff of this department. In all of the instruction it is recognized that production methods are of major significance in obtaining large yields, low costs, and products that will command maximum prices. Since practices are constantly subject to rapid change, the teaching is based primarily on principles rather than on mere sets of cultural directions.

A new course, in the grading and handling of vegetables, was offered for the first time this year. It was concerned with such questions as time and manner of harvesting, grading, packing, refrigeration, packages, and the like — questions relating to the character and the handling of the product itself, rather than to business organization and selling processes.

There is urgent need for research on vegetable-handling problems to parallel the studies being made on the economics of marketing. Careful studies should be made of the effects of cultural practices, the methods and time of harvesting, grading, packing, car loading, precooling, and storage, on the market quality of vegetable products. In connection with transportation and storage, studies are needed to determine the changes taking place in the product and the factors affecting the course and the rate of such changes. An additional research man should be provided for this work, as the present staff is fully employed on important projects already under way in other phases.

An additional extension man is needed for work in commercial vegetable gardening, especially in connection with the important canning crops and with potatoes. Cannery and canning-crop growers have persistently asked for more assistance than it is possible for the department to supply. Funds to meet this need have been requested of the Legislature.

An inexpensive new service building is seriously needed at the gardens, as the present building is an old structure scarcely worth keeping in repair and inadequate to the requirements for workroom space and for storage of tools, implements, and other equipment and supplies needed at the gardens.

RESEARCH ACTIVITIES OF THE STATE COLLEGE OF AGRICULTURE AND OF THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

The researches here reported and discussed derive their character from the threefold nature of the research work which the institution is called upon to undertake: first, the specific agricultural investigations of direct significance to farmers in New York, representing the work of the Cornell University Agricultural Experiment Station; secondly, the studies which are necessitated by the status of knowledge in the several fields and by the requirements of sound teaching, and which therefore reflect the areas in which additional knowledge is required in order that a surer scientific foundation may be laid for the educational program; and thirdly, the investigations that are an essential part of the work of postgraduate students and are related to their particular needs or particular interests. The last-named may be concerned either with the station program or the needs of the field of knowledge, or they may deal with matters of special interest from the standpoint of the country, the State, or the field of agriculture or of agricultural science in which the individual student expects to spend his life. The number and the diversity of the investigations here recorded find their explanation in these facts.

In order to indicate the situation confronting the several departments in the conduct of research, it has seemed desirable to include, in some cases, not only the projects which have been brought to completion during the year and the results given to the public, but also those projects on

which work is under way but not completed, and other fields of immediate importance to the agriculture of the State in which it is desired to inaugurate investigations as soon as funds and personnel become available.

Agricultural Economics and Farm Management

Review of the work for the past four years. Four years ago the Legislature made a special appropriation for work in agricultural business and marketing. It is therefore appropriate at this time to summarize the accomplishments thus far made possible by these funds. Some extension and teaching was begun at once; but, because of the limited amount of information available, special attention was given to research. A number of research instructors started work on some of the more important marketing and business problems. By using a number of young men at small salaries, who were also enrolled as postgraduate students, it was possible to cover a much wider range than otherwise could have been undertaken.

The intent of the appropriation was to provide for research in the fields of agricultural marketing and agricultural business, and to provide that the results of such research should be taught to students planning to go into the various businesses associated with agriculture as well as to students planning to farm. The work has now progressed far enough so that the great demand for such training is evident. Students who have had this instruction are engaged in a great variety of agricultural businesses. Many of them are working for cooperative organizations which handle milk, feed, seed, fertilizers, and other such products. Others are employed by banks (including Federal Land Banks), fire-insurance companies, farm-machinery manufacturers, fertilizer companies, commission houses, seed firms, packing houses, railroads, milk distributors, chain stores—in fact, almost every conceivable business associated with agriculture might be listed. More of these students go into farming than into any other single occupation.

Farm Economics is a monthly publication giving a review of the agricultural situation, including brief results of research work which farmers should receive promptly. For a number of years mimeographed sheets were given out during Farmers' Week. But the increased amount of research called for some means of quick dissemination of the more important results, and the publication of *Farm Economics* was begun. Thus far, 944 pages have been published. This work is used as the basis of news articles which are widely circulated by the Office of Publications of the College.

Some of the publications of the Department of Agricultural Economics and Farm Management are listed below. These are in addition to all material published in *Farm Economics*, in scientific journals, in farm papers, and in miscellaneous publications.

The dairy industry

The following studies in the production and marketing of dairy products have been completed:

1. G. Misner—An economic study of dairying on 163 farms in Herkimer County, New York. Cornell Univ. Agr. Exp. Sta. Bul. 432. September, 1924.
2. G. Misner—Economic studies of dairy farming in New York. II. Grade A milk with and without cash crops. Cornell Univ. Agr. Exp. Sta. Bul. 433. October, 1924.
3. G. Misner—Economic studies of dairy farming in New York. III. Grade B milk with alfalfa roughage. Cornell Univ. Agr. Exp. Sta. Bul. 438. March, 1925.
4. G. Misner—Economic studies of dairy farming in New York. IV. Grade B milk with cash crops and mixed hay roughage, crop year 1921. Cornell Univ. Agr. Exp. Sta. Bul. 441. August, 1925.
5. G. Misner—Economic studies of dairy farming in New York. V. Cheese-factory milk. Cornell Univ. Agr. Exp. Sta. Bul. 442. September, 1925.
6. G. Misner—Economic studies of dairy farming in New York. VI. Grade B milk with cash crops and mixed hay roughage, crop year 1922. Cornell Univ. Agr. Exp. Sta. Bul. 452. August, 1926.
7. G. Misner—Economic studies of dairy farming in New York. VII. Grade B milk with cash crops and mixed hay roughage, crop year 1923. Cornell Univ. Agr. Exp. Sta. Bul. 455. October, 1926.
8. G. Misner—Economic studies of dairy farming in New York. VIII. Grade B milk with cash crops and mixed hay roughage, crop year 1924. Cornell Univ. Agr. Exp. Sta. Bul. 462. March, 1928.
9. F. Hall—An economic study of farm buildings in New York. (Ready for publication.)
10. C. Neethling—Economic studies of dairy farming in New York. IX. Grade B milk with cash crops and mixed hay roughage, crop year 1925, with five-year comparisons. (Ready for publication.)
11. A. Ross—The demand side of the New York milk market. Cornell Univ. Agr. Exp. Sta. Bul. 459. July, 1927.
12. J. Norton and Leland Spencer—A preliminary survey of milk marketing in New York. Cornell Univ. Agr. Exp. Sta. Bul. 445. November, 1925.
13. Leland Spencer—The cost of hauling milk in the country. (In press.)
14. C. K. Tucker—Costs of country-milk-plant operations. (Manuscript completed.)

The following studies are under way:

- Relation of intensity of operation of dairy farms to net returns.
- Factors causing seasonal variation in milk production.
- Relation of composition of rations to milk production.
- Business organization of dairy and crop farms.
- A study of the market for New York State milk through ice cream.
- Study of the milk supply for the New York metropolitan area, with special reference to adjustments necessary to insure an adequate future supply of milk. (In cooperation with the New York Central Railroad.)
- Studies of the assembling of milk at country plants.
- Preliminary study of factors affecting the supply of milk in New York State.
- An economic study of membership problems of cooperative milk organizations. (In cooperation with the Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C.)

The apple and grape industries

Extensive work on the apple industry has been begun. The following studies have been completed:

1. F. Warren, G. P. Scoville, and others—The apple situation in New York State. A preliminary report. Published in 1927. (The final report is ready for publication.)
2. P. Scoville—Apple varieties, their age, yields, prices, and relative profits, 200 farms, Newfane, New York, 1918–1926. (In preparation for publication.)
3. E. LaMont—The cost of producing apples on Newfane farms, Niagara County, 1926.

- R. B. Corbett—An economic study concerning the operations of fruit and vegetable shippers in western New York. Cornell Univ. Agr. Exp. Sta. Bul. 453. September, 1926.
- R. B. Corbett—An economic study of certain phases of fruit marketing in western New York. Cornell Univ. Agr. Exp. Sta. Bul. 464. March, 1928.
- R. B. Corbett—Costs of packing apples, and comparisons of returns on apples sold in straight and in mixed cars.

The following investigations are under way:

Labor-income studies in Newfane, Niagara County, New York, have been made since 1913. A total of 2069 labor-income records have been taken during the fourteen years.

In addition to the income studies, a study of apple-orchard costs was begun last year. A study of the marketing of apples was begun in 1927.

Work on the grape industry is proposed for next year.

Poultry

The following studies have been published:

- E. G. Misner—Economic studies of poultry farming in New York. I. Thirty-two farms on Long Island, year ending September 30, 1926. (With E. R. Johnson and D. R. Marble.) Mimeographed report, 75 pages. May, 1927.
- E. G. Misner—Economic studies of poultry farming in New York. II. One hundred and twenty-one farms not on Long Island. (With E. R. Johnson and D. R. Marble.) Mimeographed report, 73 pages. October, 1927.

It is anticipated that a study of the marketing of eggs will be undertaken in 1928.

Farm land

The following work has been completed:

- William Allen—The utilization of marginal and submarginal hill-farm land. (In process of publication.)
- L. M. Vaughn—An economic study of abandoned farm areas in the State of New York.

The following studies are under way:

- A study of the appraisal of farm land. (In cooperation with the Federal Land Bank of Springfield, Massachusetts.)
- Abandoned farm areas in southern New York. (This study will be continued in other parts of New York.)

Taxation

The following work has been completed:

- M. S. Kendrick—An index number of farm taxes in New York, and its relation to various other economic factors. Cornell Univ. Agr. Exp. Sta. Bul. 457. December, 1926.
- M. S. Kendrick—The collection of general-property taxes on farm property in the United States, with emphasis on New York. Cornell Univ. Agr. Exp. Sta. Bul. 469. June, 1928.
- I. J. Call—Taxation on New York farms.

The following studies are under way:

- A study of the comparative costs of government with large and with small county boards.
- Percentages of income from property taken for taxes compared with taxation of income from other sources.

Transportation

The following work has been completed:

S. Gabriel—Index numbers of freight rates and their relation to agricultural prices and production. Cornell Univ. Agr. Exp. Sta. Bul. 446. December, 1925.

C. Lininger—An index number of express rates. (In cooperation with the *American Agriculturist*.)

Research in this field is temporarily discontinued. The many problems of transportation deserve the continuous attention of one professor.

Other marketing problems

The following work has been completed:

L. Misner—The marketing of cabbage. Cornell Univ. Agr. Exp. Sta. Bul. 443. October, 1925.

P. Rasmussen—An economic study of the marketing of New York potatoes. Cornell Univ. Agr. Exp. Sta. Bul. 440. June, 1925.

North Walker—An economic study of the production and marketing of New York market peas. (Ready for publication.)

F. Thurston—The outlook for market hay in New York State.

The following work is under way:

Study of wholesale and retail margins of marketing of fruits and vegetables.

Marketing of honey.

Economic study of the production and marketing of New York State lettuce.

Study of the cost of production, the marketing, and the prices of beans.

Agricultural history

The following work has been completed:

J. Walrath—A history of the agriculture of Tompkins County, New York.

Graue—The development of manufacturing industries in relation to the relatively increased demand for agricultural products and the elasticity of that demand.

Feed stores

The following studies have been completed:

A. Perregaux—An economic study of retail feed stores in New York State. (In process of publication.)

The following studies are under way:

Business analysis of costs and management problems in retail feed stores. (Practically completed.)

Accounting system for retail feed stores.

Cooperation

The following bulletins have been published:

W. Bartlett—The organization and development of cooperative fire insurance companies in New York. Cornell Univ. Agr. Exp. Sta. Bul. 435. December, 1924.

F. Booth—Farmers' cooperative business organizations in New York. Cornell Univ. Agr. Exp. Sta. Bul. 461. March, 1928.

The following work is under way:

Study of the membership of dairy cooperative organizations.

Analysis of the annual reports of New York State cooperatives.

Prices

The following studies have been completed:

- G. F. Warren and F. A. Pearson—Interrelationships of supply and price. Cornell Univ. Agr. Exp. Sta. Bul. 466. March, 1928.
 G. F. Warren and F. A. Pearson—The agricultural situation. (Book.) 1924.
 V. P. Timoshenko—Wheat prices and the world wheat market. A statistical study of wheat prices, with special reference to the competition between North America and eastern Europe on the west-European market. (In process of publication.)
 E. E. Vial—Prices of fertilizer materials, and factors affecting the fertilizer tonnage. (In cooperation with the N. V. Potash Export MY of Amsterdam, Holland.) (In process of publication.)

The following studies are under way:

- Index numbers of à-la-carte prices of foods in hotels.
 Profits and losses from holding corn, oats, wheat, potatoes, and cabbage.
 A study of the premiums on prices of different grades of cattle and sheep.
 The cost of distributing food.
 Cyclical analysis of farm prices of livestock.
 Wholesale and retail prices of feed.
 Prices of peaches in New York City.
 Factors affecting the price of grapes.
 Prices of garden seed.
 Prices of purebred cattle.
 An analysis of the purchasing and selling of horses.
 Effect of cabbage prices on the subsequent crop.
 Continuation of the study of the agricultural depression.
 Effect of the price of lambs at Buffalo on subsequent receipts.
 Effect of grain prices on receipts.
 A study of prices of different grades of eggs.
 Effect of price on the volume of feed sold at retail.
 Relation of cash and future prices in hedging purchases and sales of grain.

Credit

The following work has been completed:

- L. Spencer—An economic study of rural store credit in New York. Cornell Univ. Agr. Exp. Sta. Bul. 430. September, 1924.

The following work is under way:

- Analysis of the needs of short-time credit of New York farmers.

Other studies

The following work has been completed:

- J. F. Harriott—Farm tenure in New York.
 J. L. Tennant—The economic relationships between roads and agriculture in New York.
 E. G. Misner—Studies of the relation of weather to the production and price of farm products. I. Corn. Mimeographed report, 193 pages. March, 1928.

The following studies are under way:

- A study of electrification of the farm.
 A study of the relation of weather to the production and price of farm products. (This study is being conducted for cotton, tobacco, hay, wheat, potatoes, and other products.)

An economic study of tractors on farms in New York.

A study of the methods of forecasting the yield and production of crops.

A farm survey of Tompkins County. (Such a survey was made in 1908 and repeated in 1918. A survey of the same farms in 1928 is in progress. It is proposed to study the changes that have occurred in the land, in the types of farming, and in the progress of the individuals.)

Agronomy

The research activities of the Department of Agronomy are based primarily on the soil and crop surveys made by the department, which help to point out agricultural needs and possibilities, and on the observations of the extension specialists, whose intimate contact with farmers furnishes similar information. This is followed by experimentation at the College and on outlying experimental fields under plans suggested by the agencies mentioned.

The soil survey. The soil-survey enterprise, conducted in cooperation with the Bureau of Chemistry and Soils of the United States Department of Agriculture, is progressing at a rather moderate rate but in a very satisfactory way. Owing to revisions in classification of soils, the methods of work are being more carefully considered than in earlier years, with the result that some of the soil series are being separated into new series. Such a separation gives a more exact knowledge of the properties of a series than existed previously. During the period required for this study of methods, it is not desirable to push the survey more rapidly than it is proceeding at present; but when a satisfactory practice has been worked out, progress should be accelerated, so as to finish the surveys of all the agricultural counties of the State within a few years and thus give all of those interested in the results of the survey the benefits which it affords.

The crop survey. Since a crop survey is based on the soil survey, it cannot be conducted in counties that have not been covered by the latter. The crop survey is a very recent enterprise and only four counties have been surveyed up to the present time. Thus there remain twenty-eight counties that have had a soil but not a crop survey. Adequate methods have been devised for this kind of survey, and it should be pushed as rapidly as possible. Stated provision should be made for conducting the work, which now depends on such funds as may chance to be available.

The pasture survey. One phase of the crop survey is the pasture survey. This has proceeded on somewhat different lines, because the first step demanded by the pasture situation was to establish the location of the various areas in the State in which certain pasture grasses predominate. This has been nearly accomplished. The next step should be a study of the habits of growth, the nutritive qualities, and the methods for increasing productivity, of these grasses. More time, investigation, labor, and equipment will be required for this program of pasture improvement than for the survey, and more money than is now available will be needed.

Study of soil types. Supplementing the examination of soil types *in situ* as conducted by the soil surveyors, a further study of the properties of these soils is being made at the College. Samples representative of most of the soil types on the surveys made up to the present are obtained by the soil surveyor and brought to the laboratory, where determinations

are made of the important chemical constituents. An inventory of the potential fertility of the various soil types is obtained by these analyses. The analyses show also whether the chemical composition of a soil type is fairly constant throughout the State, or whether it varies in different localities. This is of practical importance, in that it is one of the factors that bear on the question whether the College can recommend certain methods of soil management on the basis of soil type.

Another means of studying soil types consists in bringing to the College samples of important types from several localities and testing them for their lime and fertilizer needs by means of cropping them. Large quantities of soil are required, amounting to between nine and ten tons for each sample. These are placed in receptacles in the field and cropped for several years.

Both of these studies have been of great help to the extension specialists, and they should be developed more rapidly in the future than they have been in the past. Especially is this true of the lime and fertilizer tests, which are more expensive to conduct and consequently have not progressed very far although they have been in operation for sixteen years.

Outlying experimental fields. On two of the predominating types of soil, experimental fields are located. This method of experimentation permits of greater range of treatment than can be given to samples brought to the College, and economic practices can be worked out to an extent not possible with the latter method. Still more important is the fact that the fields are used also for experiments with field crops, experiments that must be conducted under the ecological conditions to which the results are to be applied.

It is desirable to extend the system of outlying field experimentation to three other agricultural regions of the State. These are: (1) some part of the sandy-land region south or west of the Adirondack Mountains; (2) northern New York, probably St. Lawrence County, where a study of forage-crop production in relation to dairy farming is now in demand; (3) the red-soil areas of Chenango and Delaware Counties, the most important dairy region of the State.

The almost critical state of the dairy industry in New York calls for all the information regarding economical production of market milk that can be obtained. Experimental fields in the dairy regions mentioned would contribute much of value. It is not possible for the department to take care of more fields with the present staff and funds.

The experimentation outside of Ithaca, excepting the soil survey, should be provided for more adequately than it is at present. If it is to be developed, more scientific help will be needed or else persons now in the department should be relieved of their present duties and assigned to this work. The most satisfactory plan of operation is for the College to own its outlying fields. Now is the most opportune time to purchase land for this purpose, since it will probably be increasing in price as farming becomes more profitable.

Investigation of muck soils. The difficulties experienced by vegetable growers on muck soils point to the possibility that the condition of the soil is the cause of some of their troubles. It would not be unexpected if this is the case, because excessive quantities of mineral fertilizers have

been applied to the soil annually. The amounts of mineral matter added to these soils have been much greater than the crops have been able to remove. It is probable that drainage water has not carried off the remainder, but that from year to year the fertilizer salts have accumulated in the soil.

The whole subject is one that will have to be investigated some day, and the sooner it is undertaken, the smaller will be the loss to the growers. To lay a foundation for the study, a classification of the various mucks would be the first step. While the investigator is making a survey for purposes of classification, he can be studying the difficulties as they appear on the various areas and the conditions that accompany them.

Experiments with field crops. There are many questions in the production of field crops which farmers are not able to work out for themselves but which are susceptible to solution by comparatively simple field tests. Some of these, as they present themselves to the extension specialists, are as follows:

Alfalfa, planting alone and in combinations. The practice of mixing clover or timothy, or clover and timothy, with alfalfa seedings is increasing, and it is desirable to have some information concerning the relative merits of such mixtures as compared with alfalfa alone.

Alfalfa, method of seeding. Because of the increasing acreage of alfalfa in New York, there should be more definite information concerning the best methods of seeding the crop. In the drier sections the common practice is to seed without a nurse crop, but in the more humid sections alfalfa is usually seeded with a nurse crop. There should be more accurate information concerning the relative merits of seeding alone and with the following crops: winter wheat or rye; spring grains, barley or oats, oats and peas for hay, canning peas; in corn at the last cultivation.

Alfalfa, time of harvesting. Recent observations on early harvesting in order to secure three or more cuttings each season, show that the total annual production and the longevity of the sod are reduced by too early cutting. We should know the time of cutting and the number of cuttings for maximum yields under New York conditions. Early cuttings may favor the development of grasses and weeds which may crowd out the alfalfa, and may also have an injurious physiological effect upon the plant.

Alfalfa, strain or variety test. Tests should be made to determine the value of both common and variegated varieties of alfalfa from different sources, also the types of root systems and the crown characters of each variety. As the depth of the crown is very probably closely correlated with winterkilling, special attention should be given to the factors determining the amount of heaving and the depth of the crown of the different varieties.

Soybeans, utilization of the crop. Due to the increased interest in soybeans, more definite information is desired concerning the best utilization of the crop in New York State. The crop can very probably be best utilized by growing it on light soils, more or less acid and low in nitrogen.

Soybeans as a grain crop. Studies should be made of the varieties and of the methods and dates of planting, cultivation, and harvesting of soybeans, with a view to determining the possibility of substituting soy-

beans for oats or other spring grain crops on dairy farms, because of their greater producing power and their ability to produce more protein.

Soybeans as a hay crop. The best varieties for use as hay should be determined, also the relative merits of drilling alone or mixed with sudan grass, or seeding in rows as with corn. As it is often necessary to cultivate soybeans grown for hay, special attention should be given to the best time, the frequency, and the method of cultivating.

Soybeans as a silage crop. The best varieties for silage and the methods and dates of planting, cultivating, and harvesting, should be determined. Particular attention should be given to comparisons of silage production with corn alone, and soybean and corn mixtures. If possible, the mixture should be grown on soils relatively low in nitrogen. There are some indications that the addition of the soybean in corn, on a soil well supplied with nitrogen, will reduce the tonnage of silage per acre. There should also be determined the possibility of increasing the protein content of silage without too much reduction in total tonnage yield by planting about two-thirds to three-fourths of the regular silage area to corn in the usual manner, and the remaining portion of the field to soybeans alone, the corn and the soybeans to be mixed as the silo is filled.

Spring grain crops, growing mixtures. It is generally accepted that a mixture of oats and barley on fertile soils will yield more grain per acre than either crop will yield in pure culture. There is some doubt about the advisability of adding barley with oats on poor soils. There should be more accurate information concerning the varieties to mix and the proportion and rate of seeding per acre.

Spring grain crops, addition of Canada field peas to mixture. The best varieties of Canada field peas to mix with oats or barley, and the proportion of the mixture for different degrees of soil fertility, should be determined.

Catch hay crops. The date of planting is one of the principal factors determining the selection of catch hay crops. Such crops as oats and Canada field peas grow best in a cool season, and must be planted early to get a satisfactory crop; while such crops as sudan grass, millets, and sorghums do best when planted later in the season. There are a number of possible crops, the selection depending principally upon the date of seeding, as: oats and peas; soybeans alone, or mixed with sudan grass, sorghums, or millets; sorghums, sudan grass, and millets alone, or in various combinations. Ultimately there should be worked out a schedule so that for a particular planting time one can answer the question, Which is the best catch hay crop to use? Special attention should be given to any difficulties encountered in growing, harvesting, and curing the crop, also to the relative feeding value of the hay, and, if possible, to the influence on the yield of a following crop.

Nurse crops, oats as a nurse crop. Since hay is the most important farm crop in New York, more attention should be given to seeding practices. Due to the increased use of oats as a nurse crop, it has become increasingly difficult to get satisfactory crops of clover. The oat is a coarse-feeding, leafy plant, growing relatively late in the season, and is not so satisfactory as some of the other small grains for a nurse crop.

Lighter seeding of the nurse crop would undoubtedly be an advantage. Experiments should be conducted to determine the optimum rate of seeding for the nurse crop. It may be desirable to sacrifice a few bushels of oats if the total hay crop can be increased. The total production of both oats and hay from various rates of seeding of early and late varieties of oats, should be determined.

Nurse crops, corn as a nurse crop. In the cool, humid sections of the State, a number of dairy farmers are seeding clover and grass in corn at the last cultivation. It is very desirable to know to what extent and under what conditions such a practice can be followed. A large number of dairy farmers would eliminate more of the small-grain crops if they could get satisfactory results by seeding in corn. In certain sections of the New England States, practically all the clover and grass is seeded in corn.

Sweet clover. Comparisons should be made, under different methods of seeding, of the annual and biennial types of sweet clover, including both the yellow- and the white-blossom types. The possibilities of sweet clover as hay, silage, and pasture should be studied, also cultural methods for the crop, its productive power, and the rotation to which it is suited.

Miscellaneous forage crops. Investigations should be conducted with sorghums, sudan grass, millets, vetches, kudzu, Lespedeza (particularly the newly discovered type *Lespedeza stipulacea*), and wood clover. Possible uses of these crops in New York State, also varieties and cultural methods, should be studied.

Miscellaneous forage crops, new outlying field in sandy regions. A new outlying field for forage crops is needed, in the vicinity of the Adirondack Mountains. In that whole region the problems of growing forage for cows are serious. Experiments would show the farmers there how to grow more and better forage, possibly through the use of soybeans, vetch, and many other crops, and also through the adoption of methods suited to the region for growing the crops that now are grown.

Miscellaneous forage crops, pasture problems. Fuller investigation is needed of methods of improving and maintaining permanent pastures on various typical situations in New York, as, for example, typical hill pastures in southern New York, the drumlin pastures of central and western New York, the valley pastures of the whole State, and the sand-land pastures in the Adirondack section. Included in this study should be pastures that can be plowed and those that cannot. On the soils rich in lime, it should be determined whether sweet clover can be added to the pasture mixtures to advantage, both because more feed may thus be produced the first year or two, and also because by its use better pasture may be established in the end than if it had not been employed.

There is need to determine whether pasture lands which can be tilled and which are suited to rotation farming should be left in pasture or put into rotation, with pasture included in the rotation. This may be accomplished by two methods: (1) Include the land now in permanent pasture in the rotation. Lengthen the rotation a little, and leave the land down to grass a year or two longer than the regular practice, grazing the land during this extra period. Use extra seed when seeding down to grass. This method usually gives more grazing per acre than do the best permanent pastures. The same size of area is plowed each year as in the

regular practice. The extra expense is for fencing and grass seed. (2) Follow the same system of farming as at present on the land now being cultivated. Put the present permanent-pasture area into a rotation three or four years long, including sweet clover. Pasture the sweet clover. Let from one-third to one-fourth of the land now in pasture graze the stock. At the same time improve the land through using sweet clover. Grow more crops and have better pasture. This method involves more fencing than is now used, and also the cultivation of more land.

A study should be made of the possibility of using legumes with a low lime requirement for many of the poorer pastures. Hop clover and black medick may have possibilities.

Publications. Following are abstracts of publications by members of the department which have appeared during the year 1927-28:

- P. G. Krishna—Cellulose decomposition products as sources of energy for *Azotobacter* and *B. amylobacter*. Amer. Soc. Agron. Journ. 20:511-514. 1928.

Cellulose in the form of ground filter paper could not be used by *Azotobacter* in pure culture as a source of energy for nitrogen fixation. In impure cultures, straw furnished the needed energy material for both *Azotobacter* and *B. amylobacter*. The latter fixed more nitrogen when accompanied by cellulose-decomposing bacteria than when accompanied by *Trichoderma*.

- P. G. Krishna—Soil reaction and nitrogen fixation. Amer. Soc. Agron. Journ. 20:515-518. 1928.

Confirming the results obtained by other investigators, these observations show a very good correlation between the reaction of the soils and their nitrogen fixation. There was a progressive increase in the amounts of nitrogen fixed, with decreasing acidity of the soils. About 3.0 milligrams of nitrogen were fixed by soils with reactions between pH 5.2 and 5.9, while between 3.6 and 4.7 milligrams of nitrogen were fixed in soils with reactions between pH 5.9 and 7.65. There was no correlation between numbers of bacteria and nitrogen fixation, between numbers of bacteria and soil reaction, or between soil reaction and the disappearance of dextrose. The soil reaction is the dominant factor influencing nitrogen fixation in soils.

- H. P. Cooper and J. K. Wilson—Correlation between electromotive series and oxidation potentials and plant and animal nutrition. Science 66:629-631. 1927.

It is believed that the relative quantity and quality of the bases in the soil-colloidal complex is often much more important than the H-ion concentration, in determining the distribution and the dominance of certain plants. An attempt has been made to express the quality of the soil bases, as well as the nutrient anions, in terms of oxidation-reduction-potential levels.

Some data reported by Sante Mattson and others indicate that there is a close correlation between the order of appearance of cations in the cathode chamber in the electrodialysis of a soil colloid, and the electromotive series. Apparently ions tend to be absorbed by organisms in the same order as they are removed from the soil colloid. However, the correlation between the absorption of ions and the electromotive series may not be as close as the correlation between the series and the removal of ions from the soil colloid, because there are numerous other factors besides the oxidation-reduction potentials influencing the absorption of ions.

It is suggested that the electromotive series and the oxidation-reduction potentials may be the key to the interpretation of some of the very important works on antagonism and selective absorption.

- T. L. Lyon and B. D. Wilson—Some relations of green manures to the nitrogen of a soil. Cornell Univ. Agr. Exp. Sta. Memoir 115. 1928.

In the experiments described, covering a series of ten years, a number of green manures used as cover crops were grown in order to compare them with respect to the rate of accumulation of nitrates following the plowing-under of the crop. Also, the practice of plowing under cover crops in the spring was

compared with similar treatment in the fall, to determine the effect on the nitrate content of the soil in the early growing season.

Not all legumes were found to be more effective than non-legumes in affecting a high content of nitrate nitrogen in the soil after being plowed under. The stage of growth, and consequently the nitrogen content of the plants, apparently determined the effect on the nitrate content of the soil. Fall plowing was productive of more nitrates in early spring than was spring plowing. By mid-summer there was not much difference in the effect of the time of plowing. All of the plats in cover crops lost total nitrogen during the eleven years. There was a close correlation between the nitrate-nitrogen accumulation in the soil of the plats planted to the various cover crops, and the loss of total nitrogen from the soil.

C. Harris—Effect of lime on the availability of phosphorus in superphosphate (acid phosphate). *Amer. Soc. Agron. Journ.* 20:381–393. 1928.

It has been assumed hitherto that when lime and superphosphate are mixed, the phosphorus reverts. Chemical analyses made by a number of investigators showed the phosphorus to be in the form of tri-calcium phosphate after lime had been mixed with the superphosphate. Only one investigation had previously been conducted in which growing plants were used as an indicator of the availability of the phosphorus after being mixed with lime. That experiment was inconclusive.

In the investigation here reviewed, greenhouse tests were made with different soils and different plants, in which ground limestone was, on the one hand, mixed with the superphosphate and allowed to stand for two weeks, and, on the other, applied to the soil two weeks before the superphosphate was applied. A modification of the Neubauer test was used also. These experiments pointed to the conclusion that mixing lime with superphosphate does not, in the main, interfere with the availability of phosphorus.

Researches on the methods of chemical analysis indicated that the reversion found in that way takes place during the process of analysis.

L. Worthen—Farm soils, their management and fertilization. (Book.)

The subject matter in this book is organized on the operational basis, emphasis being placed on what to do and how and when to do it, rather than on why it should be done. The book is planned primarily for vocational schools and practical farmers. There are two introductory chapters, one dealing with factors to be considered in selecting the soil and planning its management, and the other in growing the crop. Of the six main chapters, two deal with physical properties of the soil, namely, (a) controlling the water supply and (b) tilling; and four deal with chemical properties, namely, (a) manuring, (b) liming, (c) fertilizing, and (d) "leguming" and green-manuring. In the last four chapters of the book, which are distinctly operational in character, soil-management practices are developed for (a) field soils, (b) pasture soils, (c) garden and lawn soils, and (d) fruit soils.

L. Worthen—Application of plat results to agricultural practices. *Amer. Soc. Agron. Journ.* 20:455–458. 1928.

In the application of plat results to agricultural practice the agronomist should consider three factors: (1) In evaluating results the less exacting and often less efficient practices of the farmer should be considered. The results should be analyzed from the financial standpoint. They must be economically sound, to be justified. (2) To influence the practices of the farmer, results must be published in a more or less popular form. (3) The agronomy extension program should be altered as rapidly as experimental results justify a change in recommended agronomic practices.

F. Gustafson—Handbook of fertilizers; their sources, makeup, effects, and use. (Book.)

This volume supplies, in a brief way, accurate and up-to-date information as to the source and make-up of commercial fertilizers. Special emphasis is laid on the influence of fertilizers on crops and soils. The fundamental idea of the author is to aid the grower in selecting fertilizers suitable for his particular crop and soil conditions.

The first chapter discusses the factors necessary for normal plant growth. Then follow a chapter on nitrogen, one on phosphorus, and one on potassium.

The source, physical and chemical characteristics, composition, and availability to crops, of all of the common and most of the newer fertilizers, receive adequate attention. The fifth chapter deals with the influence of the three fertilizer elements, and of the fertilizers themselves, on plant growth. The changes of the various fertilizers in the soil, and their influence on the land, receive the practical consideration which they merit.

The remaining four chapters of the book concern themselves with the nature and compounding of factory and home-mixed fertilizers, the purchase and use of fertilizers, and liming in relation to fertilizer practice. Much practical advice is contained in these chapters in addition to the fundamental information so necessary in choosing a fertilizer. Crop-production features have not been neglected by the author in order to stress fertilizer technicalities.

Animal Husbandry

Systematic records covering many of the factors concerned in the maintaining of a dairy herd have been kept by the Department of Animal Husbandry since 1889. These include breeding records, birth weights, sex, gestation periods, and production. Records of food consumed have also been kept for a number of years. For the past three years, monthly weights of all the dairy animals have been obtained. These weights provide data for studying growth, size as it is related to production, and the changes in weight during the lactation and gestation periods. Many of these records have been analyzed for classroom purposes and also by graduate students.

In order to determine what might be done practically toward the control of infectious abortion, the dairy herd has been systematically blood-tested by the agglutination method since May, 1926. No attempt has been made to separate the main herd on the basis of these tests, but records of health and production are being kept. A group of heifers tested and found free from the Bang abortion disease was segregated from the main herd in the fall of 1926. These heifers have since freshened and are being maintained as a separate abortion-free unit. Every six months all the young heifers on the farm over six months of age are tested, and those that appear clean are added to this abortion-free unit. The unit has increased until it now numbers fifteen milking cows and thirty heifers. The animals in this unit are tested once each month, and records of health and production are being kept.

More knowledge is needed regarding the relation to production of the size and development of the various organs of the dairy cow. The Bureau of Industry of the United States Department of Agriculture is carrying on extensive investigations in this field. This department has cooperated with that bureau in this work, and up to the present time forty cows of known production have been slaughtered and measured here. The cows used for this work are animals which are no longer useful as breeders or producers.

A detailed study of the normal variations in weight of dairy cattle has been undertaken. A knowledge of this normal variation is necessary for the intelligent use of weights in experimental work. These data are being collected on dairy cows, dairy heifers, and calves, and should show the degree of accuracy of a single weight as compared with weights on two or more successive days. It is planned to determine also at what time of

day the weights are most constant, and the importance and effect of each of the factors influencing variations in weight.

An inquiry has been made into the relation between wholesale and retail prices of feeds in New York State. Twenty or thirty retail dealers in the State have cooperated regularly by sending in their prices each week. Prices have not been received from exactly the same group each week, but enough prices have been received to make the averages significant. Prices have been obtained on the wholesale market for both cooperative mixed and proprietary ready-mixed rations. The result of this inquiry has not been published, but is on file and shows the margin charged by retailers over the wholesale prices on most of the ingredients used in rations for animals in New York in the years 1927 and 1928.

It has been deemed wise to continue in a larger way the inquiry into the proper plane of protein intake. Appreciating the importance of this subject, the Co-Operative Grange League Federation Exchange at Ithaca and the Dairymen's League, Incorporated, at New York City have contributed \$7500 each to carry on this experiment for two years, a special investigatorship having been established for this purpose. A suitable barn and enough land for the proper conducting of the experiment have been rented for the two years from October 1, 1928, to September 30, 1930. Thirty-six cows will be purchased for the experiment. The feeding will begin on October 1, 1928. The thirty-six cows will be divided into three groups of twelve cows each. The first group will receive a grain mixture containing 16 per cent of total crude protein. The second group will receive a grain mixture containing 20 per cent of total crude protein. The third group will receive a grain mixture containing 24 per cent of total crude protein. All the cows will be fed No. 2 timothy and white clover, the mixture containing from 30 to 50 per cent of clover. This hay will be graded by an official government grader. The silage used will be Cornell 11, grown on the farm. The cows will be fed through two lactations, without pasture between lactations.

As noted elsewhere, a fellowship has been granted to the University by the American Dry Milk Institute. A large number of calves have been raised on dry skim milk, and the results are reported in a graduate student's thesis written in 1927. The fellowship has been continued through the college year 1927-28 by a further grant from the American Dry Milk Institute. Thirty-six calves have been fed this year. The feeding of this group of calves will be completed in October, 1928.

The studies concerning the effects of calcium and phosphorus supplied in animal rations, upon bone formation, have been continued. Special attention is being given to the investigation of cheaper sources of these essential minerals for use in rearing and maintaining farm animals.

The fundamental processes involved in the secretion of milk are being studied from several angles. Since the constituents of milk must be brought to the mammary gland through the blood, this medium must reflect the fundamental factors concerned in secretion. Hemoglobin studies have been made with every member of the local herd. At the same time, studies on the relation of the blood and milk fats have been initiated. Fundamental studies of the relation of high protein levels in the diet to the secretion of milk have been carried out with laboratory animals of

short life cycles. These show that if the ration contains a definite minimum of protein, there is no increased secretion as the result of feeding levels that are extremely high.

Studies of the factors of the diet that govern the formation of the hemoglobin of the blood have shown that the protein level is without influence if an adequate minimum for maintenance is allowed. High fat diets are not detrimental to recovery from anemia. Blood of the diet is of little value in regenerating the circulating blood. Dried cooked liver has been shown to have equal value in two widely different species of animals for the cure of anemia.

In order to get more fundamental data in the field of nutrition, experiments have been undertaken with one of the lowest vertebrates, the trout. Of all the dry feeds employed in the experiments, dry skimmilk was found to produce the most rapid growth and the healthiest fish. This must be supplemented with about one-fourth of the calories of the diet in the form of raw meat. This is of considerable practical interest, since the hatcheries of the Nation spend more than half a million dollars annually for fish feeds.

Bulletins and papers published during the year include the following:

- L. A. Maynard and R. C. Bender—Lactation studies at different planes of protein intake. *Soc. Exp. Biol. and Med. Proc.* 25:388-389. 1928.

Fundamental studies on the relation of the protein level of the diet to the amount of milk secreted have been completed, using the rat as an experimental animal. This animal is of special value in such a study because of its short life cycle, its omnivorous food habits, and its production of large litters of rapidly growing young. The amount of milk secreted is gauged by the growth produced in the offspring up to the time of weaning. Protein levels varying from 18 to 50 per cent were studied. No difference in the milk produced within these limits was found. The diets containing high protein levels produced marked enlargement of the kidneys. A diet of natural feedstuffs, in contrast with a purified diet of individual, known, essential components, produced a superior yield of milk.

- C. M. McCay—The influence of protein, blood, liver, fat, iron, and potassium in the diet upon the rate of blood regeneration after hemorrhage in the rat and dog. *Amer. Journ. Physiol.* 84:16-35. 1928.

The regeneration of hemoglobin after the removal of large amounts of blood through cardiac puncture, has been studied. If adequate protein is allowed in the diet for body maintenance, the regeneration of hemoglobin is not hastened by increasing this level. Blood is a familiar constituent of both animal and human foods. In the diet it can exert little influence on recovery from anemia. Liver exerts the same marked influence on the regeneration of erythrocytes in both the rat and the dog. High fat diets do not retard recoveries from anemia. Potassium, if deficient, exerts a marked retardation in the formation of hemoglobin.

- C. M. McCay, F. C. Bing, and W. E. Dilley—The effect of variations in vitamins, protein, fat, and mineral matter in the diet upon the growth and mortality of eastern brook trout. *Amer. Fish. Soc. Trans.* 57:240. 1927.

Feeding experiments on groups of trout fingerlings are recorded. Purified rations of casein, cooked starch, mineral mixture, lard, and vitamin supplements were employed. Fish are as effectively stunted by low protein levels as are the higher vertebrates. After long periods of stunting, they also can assume a normal growth rate if allowed an adequate diet, although they can never attain the size that would have been possible in the same period of time if their growth had not been restricted. Stunting nearly doubles the length of life of animals fed purified rations. Dried skimmilk is an excellent practical food for rearing trout if it is properly supplemented with one-fourth the calories of the diet in the form of raw meat.

C. M. McCay, F. C. Bing, and W. E. Dilley—Factor H in the nutrition of trout. Amer. Fish. Soc. Trans. 57:250. 1927. Also, Science 67:249. 1928.

Nutrition studies on twenty groups of trout fingerlings are recorded. Trout are equally stunted by low protein diets, whether these diets contain 3 or 6 per cent of mineral matter. Raw meat contains a large amount of a thermolabile dietary factor, termed "H," which is essential for the life and growth of trout. This is not identical with vitamins A, B, C, D, E, or F. Dry skimmilk contains some of this factor, but not sufficient to permit of the growth and well-being of trout over a long period of time. Roughage does not improve synthetic trout rations. Artificially constructed dry skimmilk lacks factor H. The factor in liver, to which the growth of trout is due, is different from that producing blood regeneration in the higher animals.

Botany

As in previous years, many investigations are in progress in the Department of Botany, some by members of the staff and others by graduate students. In plant physiology, the studies on the banana-wilt disease and on the nutrition of saprophytic plants are being continued, as are also the studies on the translocation of materials within the plant which were begun several years ago and which have proved very important in our knowledge of that subject. The following investigations by members of the department are also in progress: a study of floral anatomy, looking toward the solution of some of our most puzzling problems of relationship and descent; cytological studies connected with inheritance (with the assistance of several International Education Board fellows); a study of the Devonian-formation fossil plants; a study of poorly known groups of New York State plants; investigations on the diseases of potatoes; investigations on the eradication of certain perennial weed plants, and on mustards; cooperative corn investigations.

During the year the following papers, prepared by members of this department and graduate students therein, have been published:

A. J. Eames and C. L. Wilson—Carpel morphology in the Cruciferae. Amer. Journ. Bot. 15:251-270. 1928.

The morphology of the ovary is here considered from the standpoint of anatomy. It is concluded that there are four carpels present, two of them reduced. The ovules are borne on the reduced carpels, but are extruded and lie within the chamber formed by the sterile carpels.

Mary Jones Fisher—The morphology and anatomy of the flowers of the Salicaceae. Amer. Journ. Bot. 15:307-326, 372-394. 1928.

The flowers of the family Salicaceae are clearly shown, by morphological and anatomical evidence, to be greatly reduced. Their simplicity is due to reduction and not to primitiveness. The flowers formerly possessed a perianth and were pollinated by insects. Wind pollination in this group is not ancient, but has been acquired recently. The honey glands represent a vestigial perianth.

Amos M. Showalter—Studies in the cytology of the Anacrogynae. IV. Fertilization in *Pellia Fabbromiana*. Ann. bot. 41 (163):409-417. 1927.

This paper describes in detail the transformation of the rod-shaped male nucleus into an optically heterogeneous, partially dispersed mass of chromatin without nuclear membrane in the cytoplasm of the egg and its fusion with the female nucleus, and concurrent changes in the cytoplasm of the egg. Eggs of this species are frequently penetrated each by two or more antherozoids, but in such cases do not develop into embryos.

Amos M. Showalter—The chromosomes of *Pellia Neesiana*. Nat. Acad. Sci. Proc. 14:63-66. 1928.

In this paper the author refutes Lorbeer's description of the chromosomes of this species, and records the presence in this species of sex-chromosomes of

the Sphaerocarpos type. (Lorbeer has admitted his error.) The X-chromosome shows a tendency to remain condensed longer than do the autosomes.

- C. A. Arnold—Some Devonian plant localities of central and western New York. *Science* 67:276-277. 1928.

The contents of this paper are sufficiently indicated by the title.

- Lewis Knudson—Symbiosis and asymbiosis relative to orchids. *New phytologist* 26:328-336. 1927.

This paper summarizes the evidence against obligative symbiosis in orchids. It critically considers various points of view proposed by other workers in this field, and emphasizes the point of view that the endophytic fungus of the orchid is necessary neither for germination nor for growth and flowering of the adult plant.

- E. F. Hopkins and F. B. Wann—Iron requirement for *Chlorella*. *Bot. gaz.* 84:407-427. 1927.

There are no fundamental data on the iron requirements of plants. This is true of both minimum and optimum amounts. This lack of information is due, in some cases, to failure to consider the solubility of the iron added to culture solutions, and in others to failure to remove completely all the iron present as impurities in such solutions. There is here presented a method of removing from culture solutions apparently the last traces of iron, by means of absorption at alkaline reactions. Further, it is shown that if sufficient sodium citrate is used in solutions free from precipitate, iron added subsequently will remain in solution indefinitely.

In an attempt to use these methods to determine the relation of iron to the growth of *Chlorella*, a high minimum concentration was found, which varied in the different series and was higher in those having a higher sodium-citrate content.

The hypothesis put forth in explanation of these results is that iron is active in growth only in the ionized form, and that increasing the amount of citrate decreases the ionization of the ferric citrate present in these solutions. Therefore, while a larger total amount of iron may be present, there may be little or no growth because of a low concentration of the ferric ion. This explanation is in keeping with the work of Uspenski.

- E. F. Hopkins—Variation in sugar content in potato tubers caused by wounding and its possible relation to respiration. *Bot. gaz.* 84:75-88. 1927.

A marked increase in sugar content is shown to follow wounding. The maximum increase found in the experiments here reported varied from 53 to 68 per cent of the original sugar content. In general, the sugar content rises to a maximum after wounding, reaching a high point after several days, and again falls off. It is possible that there is a preliminary maximum not so great as the other at the end of a few hours. From microscopical observations and chemical analyses this increase in sugar content is thought to be brought about by activities leading to callus formation.

The augmentation of respiration which follows wounding can be explained logically on the basis of the increase in the sugar content of the cells, although it is pointed out that, because of other factors, the curves for respiration and sugar content will not be exactly parallel.

- W. C. Muenscher—Plankton studies of Cayuga, Seneca, and Oneida Lakes. *New York State Conservation Dept. Ann. rept.* 17(1927), suppl.:140-157. 1928.

A report is given of a survey conducted during the summer of 1927 to study the periodicity and vertical distribution of the plankton organisms in these lakes.

- W. C. Muenscher—Vegetation of Cayuga and Seneca Lakes. *New York State Conservation Dept. Ann. rept.* 17(1927), suppl.:243-248. 1928.

This paper contains a brief discussion of the location, approximate area, and composition of the principal "weed beds" in Cayuga and Seneca Lakes. A list of the larger aquatic plants known to occur in these lakes is included.

- W. C. Muenscher and L. C. Petry—Keys to spring plants.

This work consists of a key to the families, and simple keys to the genera and species, of spring flowering plants found in the Cayuga Lake Basin. It has been prepared for the use of students in departmental courses.

Alfred Aslander—Note on the decomposition of sodium cyanide. Bot. gaz. 85:462-463. 1928.

The injurious after-effect on the soil sometimes produced by sorghum crops has been attributed to the formation of hydrocyanic acid. If this were so, then sodium cyanide, which when dissolved in water hydrolyzes, forming hydrocyanic acid and sodium hydroxide, might be expected to produce similar injury when added to the soil. Evidence was obtained indicating that sodium cyanide is decomposed rapidly in the soil and that it produced no injury to barley sown at the time of its application. It is therefore unlikely that hydrocyanic acid is the cause of the injurious after-effect of sorghum.

Alfred Aslander—A watering system for culture vessels. Bot. gaz. 84:102-105. 1927.

Donald Reddick—Building up resistance to diseases in beans. Cornell Univ. Agr. Exp. Sta. Memoir 114. 1928.

By making suitable hybridizations and testing the progenies, it has been possible to develop several varieties of field beans which are immune for both anthracnose and mosaic. Three biologic forms of the fungus causing anthracnose are involved, so that these hybrids in reality show immunity for four specific diseases. The practical problems of introducing these new varieties into commercial culture are discussed. Several varieties of beans are reported as immune for the three biologic forms of *Colletotrichum lindemuthianum*, the causal organism of bean anthracnose.

Donald Reddick—Blight-resistant potatoes. Phytopathology 18:483-502. 1928.

The potato variety Ekishirazu, from Japan, has remained highly resistant to the attacks of *Phytophthora infestans* at Ithaca, New York, from 1921 to 1927 inclusive, but the variety has no commercial possibilities in New York. Hybrids with various varieties have yielded forty-six families of plants possessing the approximate resistance of Ekishirazu, some of them decidedly tolerant to dry weather and some worthy of tests on a commercial scale. It is regarded as exhibiting a low order of parasitism. It is not known to have more than one biologically specialized form. It is thought not to be endemic to South America, but to have been introduced there and into Europe on some other solanaceous host.

Research under way at the present time includes the following lines of investigation:

K. M. Wiegand—Studies on the white asters.

K. M. Wiegand—Studies in the genus *Amelanchier*.

A. J. Eames—The anatomy of the flower.

A. J. Eames—Carpel morphology.

Gemma Jackson—The morphology and anatomy of the flower of the Rosaceae.

R. A. Laubengayer—The morphology and anatomy of the flower of the Centrospermae and allied groups.

Hattie M. Chute—The anatomy and evolution of the achene.

J. A. DeFrance—The morphology and anatomy of the flower of the Umbelliferae.

Minna F. Koch—The morphology of the corolla in the Compositae.

Anna W. Clark—The morphology of the flower of the Primulaceae.

Margaret Canby—The morphology of the androecium in the Cruciferae and allied families.

C. Petry—On the anatomy of a *Hostimella* from the Middle Devonian of Gaspé Bay.

C. Petry—On the structure of woods from the Ohio shale (Upper Devonian) of central Ohio.

A. Arnold—On the genus *Callixylon* from material collected in central and western New York.

3. McClintock—Trisomic inheritance in *Zea*.

3. McClintock—Chromosome studies in F_1 and F_2 triploid \times diploid *Zea*.

3. McClintock—Artificial production of polyploidy in *Zea*.

3. McClintock— $2N-1$ chromosomal chimera in *Zea*. (In press.)

. Dufrenoy—Cytology of certain parasitic fungi.

- O. Meurman—Chromosome numbers in *Ribes*, *Pyrus*, etc., with special reference to hybridity.
- O. Meurman—Chromosome behavior in *Ancuba japonica*.
- E. G. Stiffler—Chromosome number in *Brassica* as concerning the relationship of species, hybrids, etc.
- A. M. Showalter—Hybrid fertilization in *Riccardia pinguis*. (In press.)
- A. M. Showalter—The status of the American *Pellias* as shown by their cytological features and their sexual behavior.
- A. M. Showalter—The origin and evolution of sex-chromosomes and of sexual differentiation in the genus *Pellia*.
- A. M. Showalter—Fertilization in *Pellia Neesiana*, *P. Alleniana*, and *P. Mülleriana*.
- L. F. Randolph—Chromosome numbers in *Zea Mays* L. (In press.)
- L. F. Randolph—Embryogeny and endosperm development in *Zea*.
- L. F. Randolph—Cytological and genetical studies of extra-chromosome plants in *Zea*.
- L. F. Randolph—Chromosome studies in *Euchlaena*, *Tripsacum*, and *Tradescantia*, with special reference to the manner of chromosome pairing in meiosis.
- L. F. Randolph—Diminutive chromosomes in *Zea*, *Tradescantia*, and *Rumex*.
- L. F. Randolph—Chromosome numbers in *Rumex acetosella*.
- O. F. Curtis—Studies on translocation. Tissues concerned in the translocation of foods and nutrients, and factors influencing the rate of movement.
- A. T. Gordon—The rate of absorption and of translocation of nutrients in plants.
- Dr. F. C. Steward—The permeability of storage tissues to solutes, and the influence of various factors on this permeability.
- A. L. Baily—Comparisons of the composition of the saps obtained from various kinds of maple trees.
- H. L. Chance—The relation between catalase activity and the vigor of various inbred and crossbred strains of corn.
- A. L. Pleasants—The influence of ringing, sugar content, and nitrogen on stomatal movement.
- L. Knudson—Studies on the influence of various sugars on plant growth.
- L. Knudson—Symbiosis in *Calluna vulgaris*.
- L. Knudson—Studies on orchid-seed germination.
- T. Bacher—Influence of increasing the CO₂ and ammonia content of the air, on growth of plants.
- L. C. Schultz—Influence of rate of transpiration on composition of ash of plants.
- L. N. Allen—Stomatal behavior in bananas and other fruits.
- R. H. Hartshorn—A physiological study of chilled fruit, with special reference to the banana. (United Fruit Company fellowship.)
- R. H. Hartshorn—Effect of acetylene on the ripening of bananas.
- E. F. Hopkins—Iron ion concentration and the growth of *Chlorella*.
- E. F. Hopkins—A bibliography on potato storage.
- W. C. Muenscher and H. Craig—A study of the distribution of the weeds of New York State.
- W. C. Muenscher—Life-history studies of some perennial weeds.
- W. C. Muenscher—Experiments on weed control with the use of chlorates.
- W. C. Muenscher—Experiments on the control of some perennial weeds by ridge fallow cultivation.
- P. R. Burkholder—A study of the plankton of Cayuga Lake.
- A. Aslander—Experiments on the eradication of Canada thistle by means of chlorates and other herbicides.
- Donald Reddick—Field tests with immune hybrid beans to determine their adaptability for commercial field culture.
- Donald Reddick—The control of potato blight, caused by *Phytophthora infestans*, by the development of disease-resistant varieties.
- Donald Reddick and C. H. Myers—A study of the heredity of resistance in potato to *Phytophthora infestans*. The difficulties of this problem, namely the heterozygosity of parental stock with which one must work, have apparently been overcome by the acquisition of wild stock which breeds true.
- Donald Reddick—A study of the peach disease known as "little peach."

Dairy Industry

Rapid progress has been made on the research program of the Department of Dairy Industry during the past year. Significant contributions have been made in the fields of market-milk handling and control, dairy manufacturing, the chemistry of milk and its products, the chemistry and bacteriology of eggs, the bacteriology of milk and milk products, and bacterial taxonomy and physiology.

While all will agree that constructive research pays rich dividends to the commonwealth which supports it, it is not always possible to measure the results in concrete dollars-and-cents terms. Of outstanding practical importance is the work of Professor Paul F. Sharp, who, in cooperation with the Department of Poultry Husbandry, has devised a new method of preserving eggs, based on his studies of the chemical and bacteriological changes which take place in hens' eggs in storage. A conservative estimate of the possible value of this process to the people and to the industry runs into many millions of dollars annually. If it is applied to only five per cent of the eggs now put in storage, the yearly saving to the public would more than pay for the entire annual appropriation for the New York State College of Agriculture.

A list of the research papers published by members of the departmental staff is appended. A number of other papers are now in press, and others are in course of preparation.

G. M. Bateman and P. F. Sharp—A study of the apparent viscosity of milk as influenced by some physical factors. *Journ. agr. research* 36:647-674. 1928.

The viscosity of milk was measured under various shearing forces by means of a Bingham viscometer. The viscosity coefficient of whole milk, condensed skim milk, and even skim milk, was found to be dependent on the rate of shear, the coefficient decreasing and then approaching a constant value as the rate of shear increased. Mechanical agitation of normal whole milk was shown to cause a decrease in the viscosity, due to the breaking-up of the clumps of fat globules. The increase in viscosity of skim milk on aging could not be overcome by agitation.

James D. Brew—Statistical analysis of bacteria counts made by the direct microscopic and agar-plate method. *Internat. Assn. Dairy and Milk Inspectors. Ann. rept.* 16. 1927.

The prevalent opinion among many bacteriologists and health officials who are interested in sanitary milk control, is that the cultural-plate method used in determining the numbers of bacteria in raw milk yields more accurate and less variable results than does the direct microscopic method. A frequency distribution of 643 comparative counts reveals a surprising agreement in the general distribution of the counts of bacteria made on miscellaneous samples of raw market milk.

One method gives as accurate a picture of the bacterial condition of any given raw-milk supply as does the other. There is nothing to support the claim held by some that the counts made by the plate method are more nearly accurate than those made by the direct microscopic method. The direct microscopic method is not applicable, however, where there are only a few thousand bacteria per cubic centimeter.

James D. Brew and Richard C. Fisher—Bacteria count limits and the transportation of milk. *Cornell Univ. Agr. Exp. Sta. Bul.* 460. 1928.

All information available indicates clearly that a bacteria count limit of 1,500,000 in the raw milk as delivered by the farmer to fluid milk plants in any up-state city in New York, is so lenient as to encourage carelessness in handling. A 300,000 bacteria count limit in raw milk as delivered by the producer is a lenient standard for any city in New York, except possibly New York City.

In fact, this standard can easily be complied with even where milk is exposed, uniced, to average warm summer temperatures for as long as five to six hours. To meet this standard, however, it is necessary that the initial content immediately prior to exposure be low—at least under 20,000 per cubic centimeter.

A bacteria count limit as low as 100,000 per cubic centimeter is easily within the realm of possibility, especially in small cities where the milk en route from the farm to the plant is usually exposed to outdoor temperatures for not more than two to three hours at the most. To meet any of these lower limits, all utensils with which the milk comes in contact should be strictly clean and thoroughly sterilized; extraneous dirt should be kept from falling into the milk; and the milk should be promptly cooled, preferably to 50° or lower, and held at that temperature while at the dairy of the producer.

E. S. Guthrie—Whey butter. Cornell Univ. Agr. Exp. Sta. Bul. 468. 1928.

Sixty-six cheese factories in New York State which were reporting to the federal Bureau of Agricultural Economics in 1922, were solicited for information on details of operation. Twenty-eight replies were received. Eleven factories made butter and also occasionally sold cream to creameries. Fifteen factories made all of their cream into butter. Two plants sold all of their cream. Nine cheeseries separated whey cream during the whole year; seventeen separated only during the summer. Only two cheese-makers reported that they pasteurized the cream, and only two ran moisture tests on their butter.

A comparison of regular-cream and whey-cream butter made from the same vat of milk resulted in a mean score, for thirty-one trials, of 88.01 for the regular-cream butter and 87.53 for the whey-cream butter. The Perkins test, which is a measure of the firmness of butter, gave a reading slightly in favor of the whey-cream butter, and the body score was a little in favor of the regular-cream butter. Practically, there was no difference in the flavor or the body between these two types of butter. When the regular-cream butter was compared with mixed regular- and whey-cream butter, the difference was insignificant.

A comparison of the standing-up qualities of regular-cream and whey-cream butter showed little difference. Sweet whey-cream butter, like the regular product, maintains its flavor better than when the cream has been ripened. The difference in the holding qualities in long-time storage of whey-cream and regular-cream butter is small.

Walter Hochstrasser and Walter V. Price—Camembert cheese from pasteurized milk. Journ. dairy sci. 10:448-459. 1927.

A series of experiments were carried out to learn whether pasteurization of milk for Camembert cheese might have a favorable effect on the quality and the yield. The holder method of pasteurization was used. Careful measurements were made of the quality and the yield of cheese, and the composition of the cheese and whey. A method of manufacture was developed which seemed to produce cheese of desirable quality from pasteurized milk. The pasteurized milk could be made into cheese of better average quality and uniformity than that from raw milk. This effect was most apparent when the raw milk previous to pasteurizing was of inferior quality, although the quality of the cheese made from the heat-treated milk improved when the quality of the raw material was better. The yield of cheese from raw and from pasteurized milk was practically identical.

Georges Knaysi and J. D. Nelson—Increasing the yield of cheese by the addition of calcium chloride to milk. Journ. dairy sci. 10:396-399. 1927.

This paper reports four experiments in which an increase of 3.5 to 6 per cent of cheese was obtained from a given amount of milk on the addition of 0.1 per cent of calcium chloride to the milk previous to its coagulation by rennet. The increase is shown to be due to more moisture and fat being incorporated in the cheese, and to a more complete precipitation of milk solids not fat. The authors call attention also to the saving in rennet extract and starter resulting from the use of calcium chloride, and to its beneficial effects on the physical characters of the curd. They finally suggest an outline of the chemical changes involved.

T. J. McInerney and P. F. Sharp—The relation of the hydrogen ion concentration to the titratable acidity of milk. Internat. Assn. Dairy and Milk Inspectors. Ann. rept. 16:257. 1927.

The relationship pointed out in the paper by Sharp and McInerney (page 82) was studied in connection with neutralized milk. It was found that if milk was neutralized so that it had the same titratable acidity as that of fresh milk, the pH did not correspond to that of fresh milk but was somewhat lower, corresponding to that of slightly sour milk.

R. P. Myers—The effect of hydroxyl ion concentration on the thermal death rate of *Bacterium coli*. Journ. bact. 15:341-356. 1928.

Experiments have been made on the resistance of *Bacterium coli* to various conditions of temperature and hydroxyl-ion concentration. It has been found that different buffer mixtures of approximately the same pH value exert very different germicidal effects. The effects of pH cannot be compared when two or more different buffer systems are used, but they can be compared within a single buffer system. Increase in pH on the alkaline side of neutrality of a given solution has been shown to increase its power to destroy *B. coli* at a given temperature.

R. P. Myers—Effect of the degree of alkalinity on the germicidal properties of alkaline washing solutions. Internat. Milk Dealers' Assn. Proc. 1927.

Solutions of washing powders which gave low pH values, and accordingly weak germicidal action, were made more effective when the pH of the solution was increased by the addition of sodium hydroxide. A titration method is described in which three indicators are added in turn. The first part of the titration, the end-point of which is slightly below pH 12, gives a measure of the "effective alkalinity" and serves as a means of evaluating the germicidal potency of an alkaline solution.

Walter V. Price—A graphical method of proportioning and standardizing ice-cream mixes. Journ. dairy sci. 10:292-299. 1927.

This paper presents an explanation of a simple method of combining three milk products, all of which contain both fat, and milk solids not fat, with the other necessary mix ingredients, to form an ice-cream mix of desired composition. The calculations involved are based chiefly upon the Pearson square method of standardizing, and can be rapidly carried out. The mechanical application in factory practice of the graphical method of proportioning and standardizing is explained briefly.

Walter V. Price—Concerning the addition of calcium chloride to milk for cheese making. Journ. dairy sci. 10:373-376. 1927.

The ability of CaCl_2 to affect the yield and the quality of Cheddar cheese was tested in a series of trials. The results indicate that when CaCl_2 is added to milk at the rate of 0.1 per cent, (1) the usual amount of rennet can be reduced approximately one-half, (2) the yield is slightly greater due to better incorporation of fat in the curd, and (3) the quality of the cheese is practically the same as that which can be made from identical milk to which no CaCl_2 has been added.

Walter V. Price—Graphical standardization of condensed milk products. Journ. dairy sci. 10:377-383. 1927.

A graph is here illustrated which simplifies the usual calculations necessary to adjust the ratio of fat to milk solids not fat in mixtures of milk products to be condensed. On the coordinates of the graph are plotted percentages of fat and of milk solids not fat. A line can be drawn which is the locus of all points in

which
$$\frac{\text{Fat}}{\text{Milk solids not fat}}$$
 equals the ratio desired in the finished product. The line drawn to connect the points representing the compositions of two materials to be combined to form the mixture, is the locus of all points representing the composition of every possible combination of these materials alone. If it is possible to use the materials to make the desired mixture, these two lines will intersect at a point which represents the composition of the only combination of these milk products which can furnish fat and milk solids not fat in the desired ratio.

Walter V. Price—The use of dry skimmilk in ice-cream. Amer. Dry Milk Inst. [Chicago]. Proc. 1928.

Dry skimmilk is used by more than half of the ice-cream manufacturers who answered a questionnaire submitted to members of the industry in the United States and Canada. There appears to be a correlation between the location of the factories and the amount of dry skimmilk used. One type of dry skimmilk is used by a majority of plants, but experiments carried out in the laboratory apparently demonstrate that this selection is not justified or else it is due to factors other than the characteristics of the dry skimmilk. All of the four types of dry skimmilk used in the experimental work could be made into ice cream of satisfactory commercial quality.

Walter V. Price and Paul S. Prickett—A comparison of three methods of pasteurizing milk for cheddar cheese-making. Journ. dairy sci. 11:69-78. 1928.

The flash, holder, and so-called "flash-holder" methods of pasteurization were compared in a series of experiments. The results of the work indicate that any one of the heat treatments causes improvements in the quality and the yield of the cheese. Although the effects of the methods are not identical, the work illustrates the possibility of pasteurizing milk for Cheddar cheese in factory practice with equipment whose initial cost is not out of proportion to the total investment in the plant.

Otto Rahn and H. H. Boysen—The distribution of bacteria in butter. Journ. bact. 15:30-31. 1928.

This is a preliminary report on the influence of the distribution of bacteria on the keeping qualities of butter. Since the moisture in butter is distributed so finely that each gram contains from 12 to 18 billion droplets, while the maximum number of bacteria in butter is only 50 millions per gram, a large amount of the moisture in butter must be free from bacteria. By accurate measurements of the moisture distribution devised by the junior author in 1927, and by counting the bacteria in butter, the amounts of infected and of germ-free moisture could be computed. The germ-free proportion of the moisture was found to range from 45 per cent in butter with high bacteria counts, to 99.9 per cent in butter with a very low count.

The decomposition of butter by bacteria was measured by the formation of lactic acid in the butter. During the first two days, only the infected moisture was decomposed; but after that, especially in unwashed butter, the decomposition gradually increased. These facts show the way to the production of a butter of better keeping qualities.

P. F. Sharp and B. L. Herrington—Wheat and flour studies. XI. Note on the extraction of proteins from wheat flour. Cereal chem. 4:249-260. 1927.

Details are given of a method for successively extracting from wheat flour the protein soluble in 5-per-cent potassium-sulfate solution and in 70-per-cent ethyl alcohol. It was found that the greatest amount of protein was extracted with about 50-per-cent alcohol by both a hot and a cold extraction, but that the hot extraction removed considerably more protein than did the cold extraction. It was shown that salt solutions differed considerably in their ability to dissolve the proteins of flour. This difference was apparent, not only in the amount of protein removed, but also in the effect of differences in concentration of the salt solution on the amount of protein removed. The effect of ratio of flour to volume of extracting solution was studied also. The experimental part of this investigation was carried out at the Montana Agricultural Experiment Station.

P. F. Sharp and T. J. McInerney—The relation of the hydrogen ion concentration to the titratable acidity of milk. Journ. biol. chem. 75:177-184. 1927.

Samples of fresh milk, some abnormal, were obtained which ranged in titratable acidity from 0.50 to 0.05 per cent expressed as lactic acid, and in pH from 6.0 to 7.73.

A relation between the pH and the titratable acidity of fresh milk was found by means of which the pH can be determined from the titratable acidity, with a

average error of ± 0.06 pH, provided the titratable acidity is greater than 0.10 per cent.

A different relationship exists between the titratable acidity and the pH of sour milk, as compared with fresh milk, by means of which fresh milk, which has a high acidity, can generally be recognized.

The titratable acidity of milk is a simple index of the acidity factor, but this investigation indicates that as an adjunct a determination of the pH may in many cases be of great value in determining the condition of acidity of the milk.

F. Sharp and C. K. Powell—Physico-chemical factors influencing the keeping quality of hens' eggs in storage. World's Poultry Congress [Canada], p. 399-402. 1927.

Attention is called to the importance of the pH of the white of the egg, as controlled by the carbon-dioxide content of the air in which the eggs are stored, in relation to the changes which occur in the eggs during storage.

F. Sharp and R. Whitaker—The relation of the hydrogen ion concentration of egg white to its germicidal action. Journ. bact. 14:17-46. 1927.

The germicidal action of raw egg white is markedly influenced by the hydroxyl-ion concentration, which increases rapidly from pH 7.6 to pH 9.5 during the first days of storage of untreated eggs in a ventilated room. This increase in pH is due to the loss of carbon dioxide from the white. It was found that the hydroxyl-ion concentration in the white corresponding to that at the time when the egg was laid, would permit growth, while white with a hydroxyl-ion concentration corresponding to that of eggs aged in air for a few days was germicidal to eight of the nine test organisms used. The remaining organism, *Bacillus subtilis*, was killed very rapidly by raw egg white at all pH values. The substance which was toxic to *B. subtilis* was capable of diffusing through collodion membranes, rendering the diffusate germicidal. Heat and alcohol coagulation rendered the white less germicidal even though the pH was high. Raw egg yolk showed germicidal properties similar to the white when alkali was added to the yolk to increase the hydroxyl-ion concentration to the same level as that found in the aged white. Attention is called to the possible practical importance of variations in the hydroxyl-ion concentration of the white in resisting bacterial invasion of eggs in storage.

M. Sherman, C. N. Stark, and Pauline W. Stark—Destruction of botulinum toxin by milk bacteria. Journ. bact. 15:35-36. 1928.

The unique freedom of milk and milk products as agents in the dissemination of botulism is of great interest. Although fresh milk may ordinarily be used before bacterial growth has been sufficiently extensive to be dangerous from the standpoint of botulinum poisoning, such is not at all the case with cheese and certain other milk products. Indeed, from the standpoint of chemical composition, cheese would appear to be an excellent medium for the production of this toxin. The explanation which might appear valid is that the acidity of most types of cheese is sufficiently high to inhibit the growth of *Clostridium botulinum*, but such explanation would not hold for all types of cheese, and, from some of the experimental results which have been published concerning the acid limits for growth of this organism, would indicate that a complete explanation cannot be founded entirely on the basis of acidity in the case of any type of cheese. From our results on the destruction of toxins by bacteria, it appeared plausible that some of the characteristic milk organisms might have the power of destroying the toxin produced by *Clostridium botulinum*.

It has been found that *Streptococcus lactis* and *Lactobacillus casei* have the power to destroy botulinum toxin. This is of particular interest in connection with cheese, since in most types of cheese *S. lactis* is the predominating organism during the early stages of ripening, while *L. casei* is one of the predominating organisms in all types of cheese during the later stages of ripening.

C. N. Stark, J. M. Sherman, and Pauline W. Stark—The influence of the filtrates of *Clostridium botulinum* and *Clostridium sporogenes* upon the growth of each of these organisms. Journ. bact. 15:18. 1928.

Several investigators have noted the absence of toxin in significant amounts

when *Clostridium botulinum* is grown in mixed culture with *C. sporogenes*. It has been noted also by Dack that neither of these organisms will grow when inoculated into the unheated bacteria-free filtrate from an aged culture of the other organism. Likewise, the growth of either of these organisms is inhibited in its own filtrate.

These observations have been confirmed by the writers. It has been found that the failure of these organisms to grow satisfactorily in such filtrates is apparently due to the exhaustion of some essential food constituents. For example, if to a *sporogenes* filtrate some sterile nutrient broth is added, *C. botulinum* is able to make a vigorous growth. Similar results were obtained with *C. sporogenes* in *botulinum* filtrate, and with each of these organisms in its own filtrate.

- C. N. Stark, J. M. Sherman, and Pauline Stark—Extracellular production of toxin by *Clostridium botulinum*. Soc. Exp. Biol. and Med. Proc. 25:742-743. 1928.

From work with *Clostridium botulinum* (Type A) it has been concluded that the toxin is produced entirely intracellularly, or nearly so, in some media, while it may be produced both intracellularly and extracellularly in certain other media.

If a bacteria-free filtrate of the botulinum organism is mixed with sterile skim milk and the mixture incubated at 37° C. until proteolysis ensues, a material increase in toxicity takes place. Similar results have been obtained with purified casein solutions in place of skim milk, and likewise when the filtrate is incubated with a suspension of sterile yeast cells. On the other hand, the authors did not succeed in demonstrating a comparable increase in toxin when the filtrate was allowed to act upon peptone, ash-free gelatin, extract of fresh beef (in concentrations used in bacteriological media), and trypsin-digested milk.

That the increased toxicity obtained by the action of botulinum filtrate upon skim milk is due to an increase in the specific toxin, is indicated by the fact that this toxicity was completely counteracted by a Type A antitoxin procured from a biological supply house.

- R. Whitaker, J. M. Sherman, and P. F. Sharp—Effect of temperature on the viscosity of skim milk. Journ. dairy sci. 10:361-371. 1927.

As the temperature is raised from 5° to 60° C., the viscosity of skim milk decreases faster than does the viscosity of water; from 60° to 70° C., the viscosity of both decrease at about the same rate; and above 70° C., the viscosity of skim milk decreases more slowly than does the viscosity of water.

Pasteurization of skim milk for thirty minutes between 40° and about 72° C. causes a decrease in viscosity, while pasteurization at higher temperatures for the same length of time causes an increase.

Pasteurization of whey for thirty minutes at temperatures below 60° C. caused a decrease in viscosity; from 60° to 100° C., an increase; and from 100° to 120° C., a decrease.

As the temperature is raised from 5° to 40° C., the density of skim milk decreases faster than does the density of water; while from 40° to 80° C., they both decrease at about the same rate.

- N. C. Wright and W. Rule—A simple form of rotating dialyzer. Journ. biol. chem. 75:185-187. 1927.

In the dialyzer described, two glass funnels of equal dimensions, the edges of which have been carefully ground and between which a membrane (cellophane) is held, are clamped together and rotated on suitable supports.

Entomology and Limnology

For many years the Department of Entomology and Limnology has carried on a great amount of investigation dealing with all phases of insect life. Nearly all of the research in this department has a direct or an indirect economic bearing. For example, the study of the structure and development of the alimentary canal of a caterpillar leads to an understanding and appreciation of the manner in which poisons are assimilated

by the larva, and may tell us why acid arsenate of lead is assimilated, and therefore effective, while basic arsenate of lead is not absorbed, and is therefore not so toxic to caterpillars. Again, before we can work intelligently with an insect pest we must know what it is, what its relations are, and something of its general habits, a knowledge of which we shall have at once if we know its relatives among the Hexapoda. Therefore the first thing an economic entomologist does is to consult the systematist or the previously published work of a systematist in order to find out the kind of insect with which he is dealing. The work, then, of the systematist is first and fundamental, and points directly toward economic results. Ecology, limnology, parasitism, and medical entomology need no discussion to elucidate their useful bearing to man, because each is obviously of direct economic value.

In the field of economic entomology, emphasis is placed on a study of insects injurious to fruits, vegetables, cereals, forage plants, forest and shade trees, ornamentals, and greenhouse plants, to farm animals, to households, and to man himself. Our publications on the cherry and apple maggots, the cabbage maggot, the cabbage aphid, clover pests, the spruce gall-aphid, aphids, on house plants, and mites on poultry, and our forthcoming bulletins on the fumigation of greenhouses, two clover leaf-rollers, the pine-leaf scale, and cutworms, together with our problems under investigation on cucumber pests, wireworms, the Hessian fly, dahlia insects, and horseflies, are evidence of the range of the economic investigations. The past work has led to definite recommendations for control, and we are looking forward to similar results from our present and future investigations.

Another division of the department deals with disease-bearing insects, such as mosquitoes and fleas. During the past year, special attention has been given to the larvicidal action of *Chara* as a means of control. The division of apiculture has devoted time to studies on the utilization of carbohydrates by bees, and to wintering conditions in the hive.

Of less direct practical value, but nevertheless important in their relation to insect control, are studies on the physiology and development of insects. Related to the work on insects in this department is that on fresh-water biology, particularly fish culture. This involves a study of the fish themselves, as well as of their breeding, food, and diseases. The importance of insects as fish food, though long known, has been especially emphasized by some recent studies here. The department has cooperated with the New York State Conservation Department in connection with a biological survey of the Oswego River system, and also with the New Jersey State Fish Hatchery in the study of fish diseases, the selective breeding of trout, and the propagation of natural fish-food organisms.

In economic ornithology and mammalogy, studies on the propagation and the disease control of some game birds, and on the control of meadow mice, are being carried on.

The following papers have been published by members and graduate students in the department:

J. C. Bradley—*Nomina conservanda*. *Science* 66:100-103. 1927.

J. C. Bradley—Sobre las hembras de las especies Americanas de "*Scolia*" del subgenero *Campsomeris* (Dielis) (Hymenoptera Scoliidae) con color del cuerpo y ropaje completamente negros. *Soc. Cien. Argentina. An.* 103:164-170. 1927.

- J. C. Bradley—Sobre el monbre de una Scolia Europea. Eos, Rev. Españ. 4:93-94. 1928.
- P. W. Claassen—Another wild life preserve near Ithaca. Science 67. 1928.
- P. W. Claassen—Additions and corrections of Plecoptera. Ent. Soc. America 1928.
- P. W. Claassen and N. L. Cutler—Biological studies of polluted waters in the Oswego watershed. New York State Conservation Dept. Ann. rept. 17(1927), 133-139. 1928.
- G. C. Embury—Surveys of game fish waters and their importance in the preservation of fishing. Outdoor America 6⁶:36. 1928.
This is a semi-popular discussion of the purpose, methods, results, and value of stream surveys.
- G. C. Embury—Stocking policy for the streams, smaller lakes, and ponds in the Oswego watershed. New York State Conservation Dept. Ann. rept. 17(1927), suppl.:17-39. 1928.
A discussion is given of the factors involved in developing a stocking policy for the Oswego River system. All fishing streams and ponds are listed with notations as to methods of stocking. Nine maps based on the topographic sheets of the United States Geological Survey accompany these lists, showing the location of all streams, lakes, and ponds. This part of the survey involved the measurement of some 7000 miles of streams and 6900 acres of lakes and ponds, exclusive of the Finger Lakes and Oneida Lake.
Of the total stream mileage, only 1688 miles were found worthy of stocking. Of this, 1430 miles were suitable for the various species of trout, 133 for large-mouth bass, and 125 miles for small-mouth bass. Of the total acreage, 137 acres were found suitable for brook trout, 316 for rainbow trout, 2334 for small-mouth bass, and 4113 for large-mouth bass. In order to properly stock the 1430 miles of trout streams, it will be necessary to plant annually about 1,031,461 young trout of fingerling size.
- Grace H. Griswold—The development of *Coccophagus gossypariae* Gahan, a parasite of the European elm scale. Ent. Soc. Amer. Ann. 20:553-555. 1927.
This newly described beneficial insect is the first parasite to have been attacking the European elm scale, which is an injurious pest in many parts of the United States. The parasite attacks immature scales in the spring and adults in the summer. In both instances more than 25 per cent of the insects examined were found to have been killed by the parasite. Data on the biological development of the parasite are given also.
- G. W. Herrick—*Scutigerella immaculata* Newport—a pest in greenhouses. Jour. econ. ent. 20:738. 1927.
This pest is discussed, also its injuries to calendulas in greenhouses in New York. A method of control is presented.
- G. W. Herrick—Sodium fluosilicate as an insecticide. Rural New-Yorker 86:1028. 1927.
- G. W. Herrick—Controlling the locust borer. Rural New-Yorker 86:1076. 1927.
- G. W. Herrick—Caterpillars mistaken for the European corn-borer. Rural New-Yorker 86:1176. 1927.
- G. W. Herrick—The fight against wireworms. Rural New-Yorker 86:1257. 1927.
- G. W. Herrick—The curious hag-moth caterpillar. Rural New-Yorker 86:1277. 1927.
- O. A. Johannsen—Macropoeza and its allies. Ent. Mitt. 16:428. 1927.
A review of a genus of ceratopogine midges is presented, with a key to the species in the world and descriptions of new species.
- O. A. Johannsen and B. F. Kingsbury. Histological technique. (Book.)
This is a textbook for workers in zoological, embryological, and histological.

laboratories. It deals with the technic of fixing, embedding, staining and mounting both vertebrate and invertebrate material. Special methods are given for various animal forms, including plankton organisms.

A. Johannsen—Note on *Macropiza* and *Paryphoconus* (Chironomidae, Dipt.). Ent. Mitt. 17:30-31. 1928.

A. Johannsen—A new midge injurious to pineapple (Ceratopoginae). Ent. Soc. Washington. Proc. 29:205-208. 1927.

Descriptions are given of the immature and adult stages of the midge *Apelma brevis*, the larva of which is recorded as breeding in the water pockets in the axils of the leaves of pineapple plants. The maggots make scars on the tender tissue of the leaf, and bacterial infection then sets in, causing rotting of the entire plant.

Robert Matheson and E. H. Hinman—*Chara fragilis* and mosquito development. Amer. journ. hygiene 8:279-292. 1928.

Robert Matheson and E. H. Hinman—A new larvicide for mosquitoes. Amer. journ. hygiene 8:293-296. 1928.

F. Phillips—Beekeeping: A discussion of the life of the honeybee and of the production of honey. (Book, revised edition.)

F. Phillips—The utilization of carbohydrates by honeybees. Journ. agr. research 35:385-428. 1927.

Former studies in digestion of bees led to results which did not harmonize with findings in beekeeping practice. The present work consisted of a determination of what chemically pure carbohydrates actually maintain life in bees. The following are utilized: dextrose, levulose, sucrose, trehalose, maltose, melezitose, indicating the presence of at least the enzymes invertase (sucrase), trehalase, maltase, melezitase. The following are not utilized: galactose, probably not mannose, lactose, raffinose, all complex polysaccharides such as dextrin, starch, inulin, glucosides, pentose sugars (rhamnose, xylose, arabinose). Bees can maintain life for a time on commercial glucose, and do still better on brown sugar. These findings support the theory that dysentery in winter is due primarily to an accumulation of dextrans in the rectal ampullae.

F. Phillips—Summary. In Symposium:—Needed lines of investigation in American entomology. Ent. Soc. Amer. Ann. 20:457-460. 1927.

F. Phillips—The place of the amateur in beekeeping. Ontario Beekeepers' Assn. Rept. 1926. 1927.

This paper presents an analysis of the present development of beekeeping in North America, with special regard to the necessity of improvement of the personnel, in order to better develop honey markets as well as to take more complete advantage of the available nectar as a source of human food.

F. Phillips—Some effects of temperature on bee activities. Iowa State Apiarist. Rept. 1927:43. 1928.

A brief account is given of observations on the effect of temperatures on the rate of various bodily activities of bees, such as flight, heartbeat, respiratory rate, and digestive processes, with an application of these results to observations on the length of life in worker bees. Applications are made also to things observed by all beekeepers in the apiary.

F. Phillips—Bee journals and organizations in Europe. Journ. econ. ent. 20:527. 1927.

This is a summary of an address delivered before the Apiculture section of the Association of Economic Entomologists in December, 1926. Statistics and other comparisons are given of the proportion of beekeepers who are subscribers to journals and members of organizations in North America and Europe, and the effect of large memberships in the European societies on the problem of wider use of honey is discussed.

F. Phillips—Can hive insulation be excessive? Amer. bee journ. 67:584. 1927.

This is an application of observations on hive temperatures to the problem

of determining the proper amount of winter insulation. Since bees are cold-blooded animals and cease heat production as soon as the surrounding temperatures rise to approximately 57° F., the conclusion is drawn that it is impossible to provide too great an amount of insulation.

- E. F. Phillips—The body temperature of the honeybee. *Amer. bee journ.* 67:630-631. 1927.

Observations on body temperatures as determined by the use of thermocouple thermometers under different conditions of bee activity are discussed. The rates of various activities as determined by the body temperature are considered, and certain applications to practical beekeeping problems are made.

- E. F. Phillips—Some international problems in beekeeping. *Bee world* 9:5. 1927.

Scientific problems in apiculture are without national significance, whereas practical problems are often limited by conditions of soils, climate, and other environmental factors which do not exist everywhere. International cooperation is thus somewhat limited to cooperation in the furtherance of scientific research in this field. The present means of international cooperation are discussed.

- E. F. Phillips—Corn sugar bill situation. *Beecause* 72:7. 1928.

This is a report on the status of legislation which would permit the undeclared use of dextrose in foods, with some discussion of the opposition of beekeepers to this legislation.

- E. F. Phillips—Beekeeping in Scotland. *Gleanings in bee culture* 55:366. 1927.

Organizations of beekeepers in Scotland, and means of control of the diseases of bees in that country, are discussed. A summary of the important research work in Scotland for the past ten years is given.

- E. F. Phillips—Note on recent accessions to Cornell beekeeping library. *Gleanings in bee culture* 56:309. 1928.

- E. F. Phillips—Acumulări în fagurii cuibului. [Accumulations on brood cells.] (In Rumanian.) *Buletinul apicultorilor* 7:1. 1928.

Observations on the accumulations of cocoons and larvae, and of fecal deposits, in combs used by bees for the rearing of brood, are recorded. These deposits occur almost exclusively at the bases of cells and not on the side walls, since worker bees remove cocoons from the side walls. The method of determining the location of these deposits is by soaking combs in water for a considerable period.

- E. F. Phillips—Standardizarea stupilor și a materialului apicol. [Standardization of hives and equipment.] (In Rumanian.) *Buletinul apicultorilor* 6:34. 1927.

Comparisons are made of the progress of beekeeping in various countries which have and which do not have official standards for beekeeping equipment. The conclusion is drawn that too great a degree of standardization of equipment is a handicap to beekeeping progress.

- E. F. Phillips—The advantages of a state official organ. *Beekeepers' forum* 1:1. 1928.

- E. F. Phillips—The 1928 corn sugar fight. *Amer. honey producer* 2:151. 1928.

The plans made for opposition to legislation in the 70th Congress on the part of beekeepers' organizations and other societies interested in the manufacture and production of pure and wholesome foods are outlined. The paper constitutes a progress report to the American Honey Producers' League by their representative at the hearings on these bills.

- E. F. Phillips—Corn sugar hearings changed to Senate committee. *Amer. honey producer* 2:153. 1928.

- E. F. Phillips—Winter temperatures in the hive. *Bee craft* 9:87. 1927.

Observations on temperatures of the hive in winter by means of thermocouple thermometers are recorded, with special reference to those occurring in periods of high humidity of the air. The effects of insulation of the hive on the inner temperatures under such conditions are described. Practical applications are suggested.

Phillips—Wintering. Bee craft 9:135. 1927.

Practical methods of winter care are discussed, for locations of high relative humidity of the air.

Phillips—[Russian title.] Answer to the question which disturbs Russian keepers. (In Russian.) Vestnik 2:155. 1927.

Phillips—[Russian title.] The risk of spreading bee diseases from the use of colonies for inoculation purposes in an experimental apiary. (In Russian.) Vestnik 3:121. 1928.

This paper contains a summary of experimental inoculations over a period of twenty-three years in the apiary of the Bureau of Entomology at Washington, D. C., with a description of the precautions taken to prevent the spread of diseases from inoculated colonies. In only one case during this period did any disease appear in colonies not thus inoculated, and this appears to have arisen from the presence of this disease in near-by apiaries. The conclusion is drawn that such inoculations do not interfere with other experimental work, and that there is no danger of drawing erroneous conclusions from the inoculation experiments.

Phillips—[Russian title.] The problem of the hive in America. (In Russian.) Pchelovodnoe djelo 8:6. 1928.

The evolution of the hive is discussed in relation to changes which have occurred in beekeeping from causes outside beekeeping itself. American beekeeping has passed through at least five distinct periods of development, some of which were rather sharply demarcated, and corresponding changes in hive construction have been found necessary.

Phillips—[Russian title.] The manufacture of comb foundation in America. (In Russian.) Pchelovodnoe djelo 8:233. 1928.

Changes which have been brought about by various American inventions in the manufacture of comb foundation are discussed. The proper angle of the base of the cell of comb foundation is discussed from measurements of the corresponding angles in combs built naturally, and the speed of acceptance of comb foundation with different cell angles is considered. The methods for preparing beeswax for sheeting, and the methods of embossing, are described.

Floriculture and Ornamental Horticulture

During the past two years important progress has been made by the Department of Floriculture and Ornamental Horticulture, in its investigation on methods of propagating woody plants. It has now become possible to continue this work on a more adequate basis, due to the special appropriation made by the Legislature for certain expansions of work in the department.

These investigations are grouped into three classes: (1) the influence of chemicals, mainly potassium permanganate and sucrose, as stimulating agents in increasing the root formation on cuttings; (2) the effect of different media on the rooting ability of cuttings; and (3) the influence of position of the cut, on the position and the extent of root formation.

Chemical treatments have been applied in two different ways: (a) by dipping the ends of the cuttings in the solutions for a certain period of time, depending on the type of cutting used and the strength of the solution; and (b) by applying the chemical to the rooting medium before the cuttings are inserted.

Both potassium permanganate and sucrose have resulted in giving considerable stimulation when used according to the first method. For the most part, potassium permanganate has given greater stimulation than has sucrose with both evergreen and deciduous cuttings. With some of the

softwood cuttings, however, the increase in rooting has been nearly as great when sucrose was used as with the potassium-permanganate treatment of similar cuttings.

The results obtained when potassium permanganate was used according to the second method of application (no sucrose was used in this method) have been somewhat inconsistent. This method of treatment has been applied both to cuttings mostly evergreens, rooted during the winter on benches in the greenhouse, and to cuttings mostly deciduous, rooted on the ordinary propagating hotbed during the summer. The strength of the solutions used has varied considerably for different tests. The results obtained during this past winter with evergreen cuttings are more consistent than any others obtained with this method of application to date. More tests should be run in order to determine the best strength of solution to be used.

2. Three types of rooting media have been used in various tests: (a) sand, as commonly used for propagating purposes; (b) imported sterilized peat moss; and (c) a mixture of equal parts, by volume, of the sand and peat. The difference in media does not seem to play quite so important a part with deciduous cuttings as with evergreens; however, the difference has been considerable in a number of cases. *Ilex* and some of the *Viburnums* have given much better results in peat, and also in the mixture, than in sand. On the other hand, *Ligustrums*, *Evonymus alatus*, and some of the *Loniceras*, have given much poorer results in peat.

For evergreens, *Taxus cuspidata* has given much the best results in peat and exceedingly poor results in the mixture of sand and peat. These results have varied somewhat with the different varieties. On the whole, evergreens have rooted better in sand and peat than in ordinary sand. Junipers have rooted best in the mixture of sand and peat, at the present stage of the studies.

3. In studying the influence of the position of the cut on the position and the extent of root formation, cuts were made (a) at the node, in the usual way, (b) from one-quarter to one-half inch above the node, and (c) from one-quarter to one-half inch below the node, on about a hundred kinds of plants. Surprising and fairly significant results were obtained on about sixty of these plants. Judging from the position of the roots, the percentage rooted, and the amount of roots, about fifty per cent of these will root just as well, if not better, when the cut is made from one-quarter to one-half inch below the node, as when the cut is made at the node in the usual way. Some have rooted better when cut at the node and others when cut above.

In floriculture the following projects received active study during the year: iris studies; phlox studies; rose studies; gladiolus studies; revision of the department's collection of nursery catalogs; and an extension of the studies to include geraniums. Certain experiments were carried on in conjunction with the Department of Entomology and Limnology and the Department of Plant Pathology.

Renewed cooperation with the American Iris Society has meant an addition of three hundred varieties of iris to our former collection of some hundred varieties. The collection of dwarf iris has been extended by some two hundred varieties. Descriptive notes were made of many of the

varieties. A special study has been made of the date at which iris varieties bloom.

The studies on perennial phlox are approaching completion after a series of interruptions due to changes in the staff and to the rapid changes in the varieties offered by the growers. The present collection contains approximately 95 per cent of the varieties listed in the trade, and has been donated by the growers on invitation. Descriptive notes and some photographic records have been made.

The rose garden has received special care during the year, and has produced two excellent series of bloom. The Department of Plant Pathology is carrying on a series of studies to determine control measures for the recently discovered pathogen, *Coniothyrium wernsdorffiae* Laubert, which causes rose canker.

The gladiolus studies were extended to include the breeding of varieties adapted to greenhouse culture. It may be necessary to procure African species in order to develop a satisfactory type for this purpose. Primulinus varieties appear to be best adapted to indoor culture at Ithaca. Physiological studies are in progress to determine methods of shortening the rest period and of initiating growth prior to planting. Additional studies are in progress to determine the effect of size of corm, date of planting, depth of planting, and age of corm, on date of bloom and productivity in blooms and corms. Methods of increasing the rate of cormel germination are included in this section of the work. Variety studies were confined largely to the character of date of bloom.

The collection of catalogs, which is used as a basis of our studies on flower varieties, has been vastly increased and a mailing list of some twenty-five thousand firm names has been compiled through the cooperation of the State Department of Entomology and of foreign governments and nurserymen. The collection promises to be very comprehensive, both in domestic and in foreign catalogs, and hence of inestimable value in obtaining descriptions of varieties and in studying nomenclature.

The studies in floriculture have been extended to include geraniums, and a collection of some two hundred varieties has been brought together. A second extension has been made in the field of perennial asters, and a collection of twenty-three varieties has been received from the Division of Foreign Seed and Plant Introduction at Washington, D. C.

In cooperation with the Department of Entomology, a series of experiments has been set up to determine the value of various insecticides in the control of the tarnished plant-bug. Some promising results were obtained from plots treated with Pyrethrum.

The gardens are increasing in popular interest, as is shown by the ever-increasing number of visitors and by a decided increase in correspondence. It is believed that the educational value of the garden is well worth while. No attempt is made to exclude the public from inspecting our experimental material. Thus far the public has cooperated by abstaining from any interference with our results. It is hoped that this happy arrangement may continue.

Forestry

The outstanding development in research work in forestry at the College during 1927-28 was the inauguration of research activities on the Arnot Forest. This forest tract of 1850 acres, located twenty miles from Ithaca and within an hour's ride by automobile from the campus, came into the possession of the University in April, 1927, as a gift from the heirs of the estate of the late Matthias H. Arnot, of Elmira, New York. It is a forest which the Department of Forestry had long desired to acquire. Its possession makes possible the realization of long-cherished plans. It will serve the department as an outdoor laboratory for instruction, as has already been noted, as a forest experiment station, and eventually, as the forest is brought under systematic management, as a demonstration area.

Starting in the summer of 1927, the research assistant professor established and made the initial measurements on sixteen permanent sample plots in the forest, which will be remeasured at intervals over a long period of years with the purpose of obtaining exact data concerning growth and yield. Other work of a preliminary nature also was done on the forest, which will enable the establishment in the near future of other research projects. In addition, a beginning was made in collecting work in the forest by members of the Department of Plant Pathology and the Department of Entomology and Limnology, which will lead eventually to surveys of the status of tree diseases and of the kinds and the depredations of insects on the tract.

Publications by members of the department during the year follow:

- J. Nelson Spaeth (in cooperation with the U. S. Forest Service)—Twenty years growth of a sprout hardwood forest in New York: a study of the effects of intermediate and reproduction cuttings. Cornell Univ. Agr. Exp. Sta. Bul. 465. 1928.

This bulletin is a study of the results of cuttings made twenty years ago under professional direction. The sample plots established in 1905 on the estate of Colonel Archibald Rogers, at Hyde Park-on-Hudson, were incidental to the placing of Crumwold Forest under management. The working plan made in 1905 has been consistently followed. The remeasurement in 1925 located 41 of the 43 original plots, and, when studied, led to the following outstanding conclusions: (1) There is a marked difference in the general trend of diameter growth of sprouts and of seedlings. Sprouts grow faster first, but seedling growth is more sustained. (2) For red oak, white oak, and chestnut oak, the period required to attain merchantable diameters may be reduced from thirty to fifty years, through continuous silvicultural management.

- A. B. Recknagel—Second-growth shortleaf pine in Berkeley County, South Carolina. North Carolina Pine Assoc. (Norfolk, Va.). Wood universal, June, 1928.

This article sets forth the results of measurements on loblolly pine (*Pinus taeda*, locally called "shortleaf") during a two-weeks study trip with seniors in the Department of Forestry at Cornell University in the spring recess of 1928. Through good fortune the sample plots established by the United States Forest Service on typical areas of second-growth *Pinus taeda* in 1910, 1916, and 1921, were located just previous to logging, and a careful remeasurement thereof was made. It was found that the average tree has consistently grown an inch in diameter at breast height in every five-years period. Per acre this second-growth pine (now thirty years old) averages 53 cords of wood, or a yearly growth of $1 \frac{4}{5}$ cords. Further studies revealed the rapid diameter growth at breast height of *Pinus taeda* throughout its life: 6 inches in ten years; 12 inches in eighteen years; 18 inches in thirty-two years; 24 inches in fifty-four years; and 30 inches in ninety-two years. These studies, it is hoped, will be continued and amplified.

Plant Breeding

The research projects of the Department of Plant Breeding have been carried forward without much change from past years.

Genetic investigations have continued primarily with wheat, oats, corn, and cabbage. Although much additional information has been accumulated about the mode of inheritance of diverse characters, it is difficult to evaluate the results of any one year. Much of the advance made in the genetics of corn has come from the work of graduate students. No papers dealing with these results have been published during the year, but several are being prepared for publication. There is under way also a comprehensive paper summarizing all available records of linkage in corn.

Two genetic researches with animal materials have been carried on during the year, under grants from the Heckscher Research Foundation. One of these deals with the genetics of certain aquarium fishes, and the other with the genetics of honeybees.

The breeding of oats, wheat, barley, corn, beans, and cabbage has progressed satisfactorily. Types of cabbage calculated to meet recent demands of the industry have been produced and are being grown for comparison with standard varieties.

Numerous crossbred strains of field and of garden beans resistant to the commoner bean diseases have been produced, and are being tested for yield with a view to the elimination of all but the better-yielding varieties before testing their adaptability in the bean sections of the State.

Somewhat remarkable increases in yield over commercial stocks of the parent varieties have been obtained from first-generation crosses of inbred strains of corn.

The papers published during the year include the following:

Allan C. Fraser and Myron Gordon—Crossing-over between the *W* and *Z* chromosome of the killifish *Platyopocilus*. *Science* 67:470. 1928.

In the killifish *Platyopocilus maculatus*, sex determination is of the *W Z* type, the female being the heterogametic sex. The characters red and spotted are sex-linked. Three cross-overs involving these characters are noted as presumably the first to be reported in the sex chromosomes of a heterogametic female.

J. R. Livermore—Some of the problems of hill selection of potatoes. *Potato Assoc. Amer. Proc.* 14. 1927.

The lack of agreement among research workers in regard to the effect of hill selection of potatoes was recognized by the author. A hypothesis is developed that a variety of potatoes is composed of many strains or lines, differing slightly each from the other, which have arisen by mutation. The process of hill selection, which is founded on the principle of pure-line selection, is then employed to isolate the various tuber-lines. These lines are compared with one another in accordance with the recently developed methods of field-plat technic for potato field trials.

A brief outline of the method of hill selection used by the Department of Plant Breeding at Cornell University is presented. The cooperators in this project should be growers of certified seed potatoes, with farms located in areas where the virus diseases can be kept below the standards set for certification. Data are presented to show that presence or absence of disease cannot completely explain the differences in yield of the various strains. It is quite necessary that equal amounts of seed stock be planted in each plat. Missing hills are not corrected for when determining yields. The final selection is based on the yield data for the last three years of the test. Data from the hill-selection plats carried on by the author are presented and discussed, to substantiate the statements made in regard to the various problems.

J. R. Livermore—A critical study of some of the factors concerned in measuring the effect of selection in the potato. Amer. Soc. Agron. Journ. 19:857-896. 1927.

The factors considered are: a comparison of the yield of hills planted with halves of the same seed tuber; the effect of missing hills; the use of percentages; the shape, size, and replication of plats.

When tubers were cut in half longitudinally and the right and left halves planted in consecutive hills systematically, the difference in yield of the hills planted with halves of the same seed tuber approximated zero.

The effect of a missing hill was found to be variable, the magnitude of the effect being markedly influenced by soil and climatic conditions. The yield of the hills adjacent to the missing hill or hills was increased at least 40 per cent in the single-hill skip study and at least 75 per cent in the double-hill skip study, when the individual differences were figured in percentage and the resulting percentages were averaged. However, when these individual differences were computed in ounces and the ultimate relationship was expressed in percentage, the lower limit of per-cent increase in yield of the adjacent hills was reduced to 30 per cent in the single-hill skip experiment and 60 per cent in the double-hill skip experiment. These data were used to point out the strong probabilities of obtaining erroneous results when using percentages instead of actual values.

Single-row plats varying in length from 12 to 168 feet were used in a precision technic study. It was found that a single-row plat 36 feet long replicated 10 times, reduced the experimental error to such a value that further increase in length or in number of replications did not effect a significant reduction in the experimental error. Replication was much more effective in reducing the experimental error than was increasing the length of plat.

T. R. Stanton and E. Dorsey—Morphological and cytological studies of an oat from Ethiopia. Amer. Soc. Agron. Journ. 19:804-818. 1927.

The authors give a description of a new species of oat (*Avena abyssinica* Hochst.). Cytological studies show that this is the second known species of *Avena* having a gametic chromosome number of fourteen.

R. G. Wiggins—Relative adaptability of red-clover seed of different origins. Cornell Univ. Agr. Exp. Sta. Bul. 463. 1928.

Investigations are reported on the relative yield and adaptability of various and regional strains of red clover from fourteen foreign countries and from sources within the United States. In all cases the tests were made in plots 60½ to 100 feet in size, triplicated, with a check of domestic (Michigan-grown) seed in every third plot.

Practically all nationalities of red-clover seed were found to have characteristic properties. Consequently, in selecting red-clover seed for use the source should be carefully noted. The closer the conditions where red-clover seed is produced are to the conditions where it is to be used, the greater is the chance of success. Italian seed is entirely unsuited to New York conditions. Foreign seed should not be used except when domestic seed is impossible to procure. If imported seed is to be used at all the exact source should be known.

Plant Pathology

Gratifying progress has been made by the Department of Plant Pathology during the past year, in the various lines of experimentation and investigation. Three agencies for research are active in the department. These are: (1) the members of the instructional and research staffs; (2) graduate students; and (3) holders of industrial fellowships, who are also registered as graduate students. About a hundred research projects, most of which are being actively promoted, have been worked into a general program for research, with each existing or new project assigned a definite place. This program keeps before the staff of the department a full picture of our research activities, and enables them to determine the extent

which the needs of the State in plant-disease control are being met. The following is a condensed outline of this program as it is now in operation:

Morphological, physiological, and taxonomic studies of bacteria and fungi.

- I. Special forms of the organism causing bean anthracnose.
- II. A study of the genus *Cercospora* (two projects).
- III. Monographic studies of the Sclerotiniaceae (ten projects).
- IV. The Pyrenomycetes (four projects).
- V. The Coryneliaceae.
- VI. Genera related to the Cucurbitaria.
- VII. The Xylariaceae.
- VIII. Influence of environmental factors on sclerotial production (two projects).
- IX. Trillium rust.

General investigations of several phases of a disease.

- I. Diseases of ornamentals, and of wild and medicinal plants (eight projects).
- II. Diseases of vegetables (four projects).
- III. Diseases of fruits (six projects).
- IV. Diseases of forest trees (eight projects).
- V. Diseases of forage crops (two projects).
- VI. Diseases of potatoes (two projects).
- VII. Diseases of miscellaneous plants (one project).

Studies of virus diseases of plants.

- I. Nature of cause.
- II. Interrelation of virus diseases (four projects).
- III. Cytological changes in host plant.
- IV. Control of mosaic diseases of potatoes (four projects).

The nature of resistance and susceptibility.

- I. Relation of health of plants to infection by fungi.
- II. Specific cases.

Environmental studies.

- I. Temperature relations with mildew and black spot of roses.
- II. Soil environment in relation to dry root-rot of beans.
- III. Unproductive muck, cause and control.
- IV. Environmental factors in lettuce tipburn.
- V. Fire blight.

Disease-control studies.

- I. The nature of fungicidal action.
 - A. Protectants (two projects).
 - B. The dynamics of toxin action (three projects).
- II. Soil treatments for seedling diseases (three projects).
- III. Dust fungicides (six projects).
- IV. Breeding and selecting for disease resistance (three projects).
- V. Miscellaneous studies.
 - A. Approach grafting for control of root rot in trees.
 - B. Leaf mold of tomato.
 - C. Control of fire blight in a commercial orchard.
 - D. Seed treatment for control of blackleg of cabbage.

Mycological surveys (seven projects).

The department has had nine temporary fellowships during the year, including five new ones as follows: the lily-disease-investigation fellowship; the Oswego Farm Bureau-Vegetable Growers' fellowship; the Tennessee-Orleans Vegetable Growers' Cooperative Association fellowship; the Niagara Sprayer Company fellowship; and the Armstrong fellowship for the investigation of shade-tree diseases. Fellowships that have been renewed or continued are: the Champlain Valley fellowship in plant pathology; and the Williamson Cooperative Vegetable Growers' Association fellowship, now in its tenth year, established by growers for the study of diseases of muck crops.

The Bayer fellowship in plant pathology, established by the Bayer Company for the study of organic mercury compounds as disinfectants, has been brought to conclusion. A substantial manuscript on the control of damping-off of coniferous tree seedlings, the investigations for which were conducted under the terms of this fellowship, is soon to be submitted for publication. The Western New York Farms Corporation fellowship, which ran for four years, has been superseded by a new fellowship supported by members of the Genesee-Orleans Vegetable Growers' Cooperative Association.

This department has now had forty special temporary fellowships, of which twenty-five have been established by organizations of growers and fifteen by commercial concerns. The former have contributed more than \$40,000 for the study of diseases of crops in which they were interested, and the latter more than \$60,000 for the investigation of the value of materials to be used as fungicides. The importance of disease control, and evidence that the State has not been too generous in its support of the work of the department, are indicated by the additional support which has come from farmers. (A fuller discussion of the fellowships is given on pages 21 to 23 of this report.)

The following papers by members of the department have been published:

M. F. Barrus—Trillium rust. *Mycologia* 20:117-126. 1928.

The trillium rust, *Aecidium trillii* Burrill, has been known since 1882 from but three localities, widely separated—Illinois, New York, and Kamchatka, Manchuria. The problem of its alternate host has been a puzzle of considerable interest to uredinologists. The author, after many years of observation and extensive inoculation work, has established the genetic connection of this *Aecidium* with the rare grass rust *Uromyces Halstedii* De Toni, occurring on *Brachyelytrum erectum*, a new grass host for the *Uromyces* stage which heretofore has been found on species of *Leersia*.

F. M. Blodgett—Tobacco mosaic on potatoes. *Phytopath.* 17:727-734. 1927.

In a study of the interrelation of virus diseases, tobacco mosaic was found to be readily transmitted to potatoes by needle punctures, producing different symptoms on different varieties of potatoes. On Green Mountain it produces necrotic streaking and spotting, on Bliss Triumph local necrotic lesions, and on No. 9 potatoes, in addition to a limited amount of streaking and spotting, a mottling similar to that on tobacco. Symptoms on potatoes were obtained only at high temperatures. The disease was transmitted back to tobacco.

F. M. Blodgett—A potato virus on peppers. *Phytopath.* 17:775-782. 1927.

A serious disease of peppers results from inoculating them with the virus from apparently healthy commercial varieties of potatoes. Faint mottling develops on leaves about half grown. The light-colored areas quickly become necrotic, and affected leaves drop shortly. The only potatoes found from which the virus could not be obtained were seedling potatoes. The potato virus is transmitted readily from one pepper to another by inoculation.

F. M. Blodgett—A preliminary experiment using calomel as a dip treatment of seed potatoes. *Amer. potato journ.* 5:6-8, 10-12. 1928.

In laboratory tests, calomel was found to inhibit the growth of the sclerotia of *Rhizoctonia*. In a field test, markedly and significantly better stands were obtained on plats where the seed was treated with hot mercuric chloride, semesan-bel dip, or calomel dip, when compared with the untreated. In this respect calomel and hot mercuric treatments were in the lead. All of these treatments gave significant increases in yield over the untreated, as follows: hot mercuric chloride, 28.9 ± 6.5 bushels per acre; semesan-bel dip, 29 ± 3.3 ; calomel dip, 21.5 ± 4.4 .

Charles Chupp—Club root in relation to soil alkalinity. *Phytopath.* 18:301–306. 1928.

For many years, growers have known that the higher the soil alkalinity the less there was of cabbage clubroot. Within recent years a convenient method has been devised for measuring accurately this alkalinity. Numerous and careful readings on a potentiometer were made of the soil acidity after various amounts of lime or sulfur had been applied. It was found that the clubroot organism is decidedly virulent up to the pH point of 6.8, and that the virulence then drops rapidly so that there is no infection above pH 7.4 and very little above 7.2. Sulfur injured the growth of cabbage and did not destroy the clubroot organism.

J. Dufrenoy—Some cytological phenomena in disease-resistant plants. (Abstract.) *Phytopath.* 18:144. 1928.

Cells of cambial tissue invaded by hyphae of certain species of *Phytophthora* are induced to divide in a transverse plane and form a pathologic layer. If the fungus grows rapidly enough to invade the meristematic cells of the pathologic layer, it continues to thrive; otherwise, the cells develop large vacuoles containing tannic compounds, the fungus starves, and the lesion is checked.

J. Dufrenoy—Cytological studies of plant tissues affected with mosaic diseases. (Abstract.) *Phytopath.* 18:154. 1928.

In a study of tissues affected with mosaic, it was found that cells in the light area differ from those of the normal green ones in certain characteristic respects as brought out by the use of stains.

H. M. Fitzpatrick—Curtis Gates Lloyd. *Mycologia* 19:153–159. 1927.

H. M. Fitzpatrick—Heart-rot of shade trees. *Tree talk* 8³:4–10. 1927.

H. M. Fitzpatrick—A mycological survey of Porto Rico and the Virgin Islands (a review). *Mycologia* 19:144–149. 1927.

George R. Gage—Studies of the life history of *Ustilago avenae* (Pers.) Jensen and of *Ustilago levis* (Kell. & Swing.) Magn. Cornell Univ. Agr. Exp. Sta. Memoir 109. 1927.

These investigations show that the heretofore commonly accepted ideas on the life histories of the two smuts of oats are largely incorrect. The smut fungi infect the blossoms of the oat plant at flowering time or the seed in storage immediately after threshing. The mycelium from the germinating spores which fall on the stigmas at flowering time invade the seed coat of the young ovaries, as well as the inside of the hull in hull-covered varieties. Here the fungus goes into a resting state until the oat seed is planted, when it resumes activity and enters the young seedling by way of the first internode. Infection by the loose-smut fungus is almost entirely blossom infection, though seed infection in storage commonly occurs, especially in hull-less varieties. The covered-smut fungus infects the late blossoms to some extent, but seed infection in storage appears to be more common. These discoveries afford a much more satisfactory basis for the development and understanding of efficient methods of controlling the smuts of oats than has been available hitherto.

Edwin E. Honey—The monilioid species of *Sclerotinia*. *Mycologia* 20:127–157. 1928.

The author reviews in detail the literature bearing on the problem of the proper generic designation of the monilioid *Sclerotinia*. He concludes that none of the genus names heretofore used can be accepted as specifically designative of these forms, or are tenable under present rules of nomenclature. He therefore establishes as the type species *Sclerotinia fructicola* (Wint.) Rehm, which he here transfers to his new genus under the name *Monilinia fructicola* (Wint.) Honey.

Edwin E. Honey and W. R. Fisher—Dark-field microscopy in the study of fungi. *Mycologia* 20:88–96. 1928.

The authors describe the application of dark-field microscopy to the photographing of the hyaline asci and ascospores of species of *Sclerotinia*. Detailed directions are given for the modified procedure which they developed in this particular case.

- H. E. Thomas—Kieffer pear seedlings and fire blight resistance. *Torrey Bot. Club. Bul.* 54:583-585. 1927.

This is a brief progress report on work started in 1921 to develop a pear resistant to fire blight. Of more than six hundred seedling trees which remained in the experiment in 1926, nearly 50 per cent were found to be highly resistant. No consistent parallel was apparent between resistance and tree characters of the parent species. Indeed, some characters of the susceptible parent (*Pyrus communis*) were more frequently associated with resistance in the seedlings than were the corresponding characters of the resistant parent (*P. serotina*).

- H. E. Thomas—Some chemical treatments of soil for the control of damping-off fungi. *Phytopath.* 17:499-506. 1927.

In an attempt to apply the principles of both disinfection and protection in soil treatments, rather than the principle of disinfection alone, now generally in use, copper carbonate, mercuric chloride, and an organic compound of mercury were used successfully in controlling damping-off of tomatoes caused by fungi of the *Phytophthora* type. The mercury compounds were effective in controlling *Rhizoctonia* damping-off of cabbage, while three copper preparations were entirely ineffective. Some of the chemicals are believed to persist in the soil in active form through the susceptible stage of the seedlings. This belief is based upon the consistent lack of reinfestation of treated soil.

- H. E. Thomas—Killing of strawberry roots. *Phytopath.* 18:245-246. 1928.

A summary of results of observations and experiments bearing chiefly on the cause of root-killing is presented. It is concluded that root-killing of strawberries in New York may result from a number of causes, important among which are the type and exposure of soil, low temperatures, mulching practice, and applications of lime. Fungi are not believed to play any important part.

- H. H. Whetzel—Dusting wheat for rust control. *Cornell countryman* 25:174. 1928.

- H. H. Whetzel—The dusting of fruit trees. *The fruit-grower [England]* 65:589-590, 625-626. 1928.

- H. H. Whetzel and H. S. Jackson—The rusts and smuts of Bermuda. *British Mycol. Soc. Trans.* 13:1-32. 1928.

This is a complete list of all rusts and smuts of plants which have been found in Bermuda to date. Field notes and critical comments are given for each species. The work is based on extensive collections made by the senior author. Nine species of smuts are recorded, of which six are here reported from Bermuda for the first time. Forty-nine species of rusts are recorded, of which twenty-four are reported for the first time from these islands. None of the species are new to science, but several new hosts for both rust and smut species are reported.

Pomology

The research projects of the Department of Pomology may be grouped under two general heads. In the first group are those that deal with the response of fruits to different conditions of soil and climate and to variations in practices of pruning, cultivation, fertilization, and the like—all problems of immediate concern to the practical grower.

At this station we have had under way for ten years or more studies that deal with the effects of different kinds and amounts of pruning on both young and mature trees. Recent indications are that the kind of pruning needed to bring about a good production and a high quality of fruit will vary not only with the variety and the age of the tree, but also with the condition of the tree as influenced especially by the previous seasons' growth and production. An important new phase of the experiment aims to determine how frequently the pruning needs to be done.

Experiments are being continued on the response of trees to cultivation different times of the year and for varying lengths of time during growing season. It now appears, from these experiments, to be far more important to have the land plowed before May, if possible, than to work the soil frequently thereafter during the next few months.

The influence of grass as compared with cultivation is receiving further attention, especially since there seems to be a tendency among some growers to shift from cultivation to the use of nitrogen fertilizers in sod orchards. Such problems as the time of application of the nitrate, the build-over influences of a single application, and the cumulative influences of the fertilizer, require special attention. Progress has been made, also, in an intensive study of the comparative use of the different forms of nitrogen, such as nitrate of soda, calcium nitrate, urea, ammonium sulfate, and other synthetic forms. The indications are that differences in response to different forms of nitrogen may be found depending upon the state of nutrition of the tree and upon the soil condition. The influence of phosphorus and of potassium on fruit-tree behavior also is under investigation.

The second group of research projects deals with a fundamental study of the nature, physiology, and structure of fruit plants and their products. In this group are found such studies as: the conditions that influence fruit-bud and flower-bud formation; pollination and other varying factors which are important in the set of fruit; root growth under different conditions of culture; the relation of maturity, handling, and storage temperature to the keeping quality of the fruit; the underlying causes of winter injury to the various parts of the fruit plant.

One of the most important objectives of the research program is to modify the violent fluctuations in yield. The department looks forward to the time when the well-informed grower may be able to overcome, to some extent, the excessive and often unprofitable crops which are commonable also for devitalized trees and which are followed by years of very poor production. All of the studies listed above aim to throw more light on the practical problems of the fruit grower, and help to build up a fund of knowledge which may ultimately be drawn upon to meet newer conditions of the fruit industry.

As every one knows, who has had intimate contact with fruit plants, there is great variation in the behavior of individual trees under different conditions, and the results of one or two years of experiment may be very misleading. It has been the policy of the department not to publish in bulletin form the results of its investigations until it is reasonably confident that the particular results observed are due to the experimental treatment rather than to some other obscure condition. On the other hand, the growers in this State are sufficiently conservative so that we can freely discuss with them, at the horticultural meetings and the extension meetings, the progress of our experiments even before the results are ready for formal publication. The important trends of our experiments have thus been made known to those chiefly interested, and the growers are gradually modifying their practices of pruning and soil management on the basis of the tentative results obtained by the department.

Many practical men who were formerly uncertain as to the need for cross-pollination for such varieties as Greening and McIntosh are now convinced, as a result of the work on this question, that a better set of fruit is often obtained where pollination has been satisfactory. The studies of the department also have shown the necessity of an extra nitrogen supply as a means of helping the set of fruit.

The following papers were published during the year :

- D. B. Carrick—The effect of freezing on the respiration of the apple. Cornell Univ. Agr. Exp. Sta. Memoir 110. 1928.

This paper shows the influence of freezing on the respiration of the Winesap, Baldwin, and McIntosh apple varieties. The amount of freezing given in all cases was under controlled conditions, and ranged from three hours after formation at an air temperature of -7.5° C. to -8.5° C., to an exposure of twenty-one hours at -7.5° C. after freezing had begun in the tissue. The measurements after each treatment were made at either 0° or 20° C. The data show that comparatively light freezing of three- and six-hour exposures induced a marked acceleration in the subsequent respiration of the tissue. This increased rate of carbon-dioxid output gradually subsided after the first few days, but even a month after the exposure some stimulation was evident. Severe freezing, in which a large proportion of the cells were killed, resulted in a marked reduction in the amount of carbon dioxid evolved. An attempt was made to explain the results and to point out their significance in the handling and storage of apples.

- A. J. Heinicke—Economic apple production under present conditions. New York State Hort. Soc. Proc. 73:39-47. 1928.

The importance of the soil conditions as a factor in the yield of apple orchards and economical means of influencing the nitrogen supply to the trees, are discussed on the basis of the recent experimental work. Emphasis is placed on the fact that the chief benefits of cultivation can be secured by plowing the orchard in spring before the bloom and working the soil for a relatively short period during early summer. Considerable labor and expense are thus saved, humus is conserved, and the color of the fruit tends to be improved.

- A. J. Heinicke—Influence of scion leaves on the quality of apples borne by the stock. Amer. Soc. Hort. Sci. Proc. 24:143-146. 1927.

From observations and experiments recorded in this paper, it appears that the fruit of the stock may be modified in quality if it is nourished largely by the leaves of the scion variety. The influence is such as to suggest that each variety manufactures, in addition to starches and sugars, specific compounds or factors for their synthesis, which under certain conditions may be transmitted by the scion to the fruit of the stock, or vice versa, without losing their distinctive characteristics. The studies offer an interesting lead in problems of food translocation, and afford a possible explanation for the modifications in fruit characters which many growers believe they have found in connection with top-working.

- E. L. Overholser—A study of the catalase of the fruits of pear varieties. Ann. Journ. bot. 15:285-306. 1928.

The activity of the enzyme catalase in pear fruits was studied, with the object of throwing light on the ripening of pear fruits at room and at storage temperatures. The data show that catalase activity varied strikingly with storage conditions and with the stage of maturity of the fruit.

- S. W. Wentworth, J. R. Furr, and J. L. Mecartney—The spur-unit method of determining the comparative effectiveness of different varieties of apple pollen. Amer. Soc. Hort. Sci. Proc. 24:85-90. 1927.

This method has been devised to test the effectiveness of different varieties of pollen in causing a set of fruit under similar conditions of competition for water and nutrients. The method involves (1) the selection of vigorous flower-bearing spurs on a number of different trees, (2) the reduction of the number of flowers of each cluster base to four selected for quality in size and maturity, and (3) the application of a different variety of pollen to each flower at the

same time. This method was tested on twenty-two McIntosh trees where Delicious, Baldwin, Rhode Island, and McIntosh pollen were permitted to compete. The results, presented graphically, show that Delicious pollen was clearly superior to the pollen of the other varieties. The data indicate also that an effective pollinizer may tend to exert its dominance more and more as the season progresses. The flowers pollinated by Delicious pollen set not only more fruits, but larger fruits which contained a greater number of mature seeds. The same relative effectiveness of the pollen varieties was obtained by each of the three workers, and the slight differences in the technic of pollination were negligible.

Poultry Husbandry

The research work of the Department of Poultry Husbandry during the year has been devoted largely to investigations in nutrition, management, breeding, incubation, and poultry-house ventilation.

The nutrition investigations have dealt with both young and mature stock. In the case of the chicks they have centered around the protein, mineral, and vitamin requirements. With the mature stock they have emphasized influence upon production and egg quality by feeds and management.

The year's work with the chicks indicates a decreasing protein requirement as growth progresses. The necessity for vitamin D has again been shown, and some data have been accumulated regarding calcium-phosphate requirements. The study of rickets still holds a prominent place in the work. Two series of experiments have been carried on to study the variation of the seasonal quality of sunshine as far as the antirachitic factor is concerned. In these, various glass substitutes have been used to determine their comparative transmission value.

This year's work substantiates the results of the preceding year in showing the necessity with mature birds for the antirachitic factor as furnished by sunshine, ultra-violet light, or cod-liver oil. Characteristic rickets has been produced in the pen deprived of sunshine. Indications are that the lack of the antirachitic factor is a chief cause of lowered egg production, higher mortality, and decreased breaking strength of eggs during the winter and early spring.

Milk as a source of animal protein has again shown its value in winter production and also in hatchability of eggs.

As a result of the continued breeding for egg production, there are now on the college farm a larger number of 200-egg hens than at any previous time.

The project in incubation in which conditions of temperature and moisture during incubation are controlled by means of carefully designed equipment, shows that humidity seems to have a definite effect on the growth, and possibly on the metabolism, of the chick embryo.

In the poultry-house-ventilation experiment it has been found that hours of daylight appeared to be the most influential single factor affecting egg production. Extremes of temperature have some effect.

Many new cost-account records on poultry farms have been obtained during the past year. Complete records from twenty-six farms give valuable information concerning the costs of production. The costs have decreased, while the prices of eggs and of poultry have decreased fairly uniformly since the high peak of 1922.

A study of media for cleaning eggs indicates that there seems to be no foundation for the belief that washing causes eggs to deteriorate, if they are properly handled after washing.

During 1927-28 the following publications by staff members appeared:

- G. F. Heuser—Nutritional factors affecting hatchability of eggs. World's Poultry Congress [Ottawa, Canada]. Proc. 1927.
- G. F. Heuser—Nutrition in "bottled sunshine." Poultry success, February, 1928.
- L. M. Hurd—Practical poultry farming. (Book.)
- P. F. Sharp and C. K. Powell—Physico-chemical factors influencing the keeping quality of hens' eggs in storage. World's Poultry Congress [Ottawa, Canada]. Proc. 1927.
- J. E. Rice—Significance of judging poultry for egg production. World's Poultry Congress [Ottawa, Canada]. Proc. 1927.

Rural Education

Some of the research projects completed by the Department of Rural Education during the past year are as follows: a study of transportation costs in New York; the training and function of the rural-school superintendent of Michigan; an evaluation of 4-H Club activities in terms of educational objectives; a study of extra-class activities in the high schools of Kentucky; a study of the bearing of the problems of broad-leaf tobacco production upon the preparation of teachers of agriculture in Connecticut; a study of the problems and difficulties of student teachers of home economics in Cornell University; the development of arithmetic as a school subject; an analysis of recent trends in geography in the elementary school; a study of the county as a factor in the development of school control; the development of supervision of instruction; a method of determining courses of study in vocational agriculture, based on an analysis of the business of selected farmers in Kentucky; factors to be considered in locating departments of vocational agriculture in the high schools of North Carolina; the elimination of students in the New York State College of Agriculture at Cornell University; a study of time and cost standards in performing farm-shop jobs; tenure of agricultural teachers in Mississippi; an evaluation of the references used in the farm-management course as taught at Trumansburg, New York; a study of certain cotton-growing operations in Alabama, as a guide in determining content in cotton-production courses; discovery of problems facing the high schools of Cumberland County, Pennsylvania; suggestions for curriculum-making in agriculture for the Negro agricultural and technical college of North Carolina; an investigation of the secretion of the parotid gland in a human adult.

The following researches are in progress: a survey of certain aspects of rural education in Tompkins County, New York; a study of financial practices in the county school systems of Kentucky; standards for measurement of a village school building used for combined elementary- and high-school purposes; factors influencing the school-building program in a rural county of Pennsylvania; a study of the field problems of teachers of agriculture in conducting supervised farm practice; a study of the methods for constructing a course in farm management in secondary schools; a study of the educational responsibilities of county agents; a

ly of factors contributing to the elementary-school curriculum of the State of New York; a study to determine the nature and degree of use of the local environment in the teaching procedures in rural schools; an investigation into the teaching of service to elementary-school teachers; an investigation of science needs of pupils in small high schools; the extent to which the graduates of the trade school at Hampton Institute engage in activities requiring some knowledge of the things learned in their respective trades; a proposed plan for the training of Negro teachers in Arkansas; an analysis of the enrollment of pupils in vocational agriculture in Pennsylvania; objective tests as a method of teaching in vocational agriculture; an analysis of enterprises in Kentucky as the basis of a program of agricultural education for Kentucky; a continuation of the survey of rural schools in the contiguous patronage area of the Horseheads, Odessa, Mansburg, and Interlaken high schools; activities analysis of teachers of vocational agriculture in twenty States; graduate courses for teachers of vocational agriculture in Indiana; an investigation of learning by young children by the method of conditioned response; a preliminary investigation of learning in the white rat, with special reference to testing the validity of the "Gestalt" hypothesis; a study of the courses of fluctuations in achievement through seven semesters, in the case of a class of seniors at the New York State College of Agriculture; a study of the acquisition of new forms of behavior in the case of pre-school children; an inventory of the abilities and traits of the students of hotel administration.

Some of the publications by members of the staff during the year 1927—are here listed:

L. Bayne, jr., and Howard S. Liddell—The study of cerebral inhibition in the sheep by the conditioned reflex method. *Amer. Psychol. Assoc. Proc.* 1927:52. 1927.

S. Liddell and T. L. Bayne—The development of "experimental neurasthenia" in the sheep during the formation of difficult conditioned reflexes.

S. Liddell and T. L. Bayne—Auditory conditioned reflexes in the thyroidectomized sheep and goat.

E. Butterworth—Rural elementary education for white pupils in Virginia. *In Public education in Virginia*, p. 69-116, 475-486.

This study was made in connection with the survey of public education made in Virginia in the fall of 1927. Data for the years 1918-19 and 1926-27 show that during the nine years the average length of term in the counties of the State increased from 147 days to 168 days; the percentage of attendance increased from 67.3 to 86.0; the percentage of teachers holding elementary certificates or below (the lower-grade certificates) decreased from 85.4 to 62.2; and the number of one-room schools decreased from 2524 to 1994. In spite of these developments the rural schools were, in 1926-27, still considerably behind the city schools in most particulars.

The report includes an analysis of the teaching in rural schools, together with the influence of such factors as experience, teaching equipment, the "home teacher," over-ageness, and the like. It includes also many details in regard to the extent and the nature of rural-school supervision; the training, experience, and working conditions of the supervisor; the training, experience, salary, and working conditions of the county superintendent; the functions and working conditions of the school principal; the age, occupation, place of residence, and length of service, of members of the county boards of education; and the leadership activities of the county superintendents. Recommendations are made for a long-time practicable program of development in rural education under conditions prevailing in the State.

- J. E. Butterworth—The principalship in rural school organization. The nation's schools 1²:13-17.

This study attempts to establish principles governing the functions of the school principal in a county school organization of the type now prevailing in Virginia. Detailed data show whether functions are now performed by the principal of the school, by the county superintendent, or by the two together. The data are so organized as to show the situation in schools of different sizes.

Two general conclusions may be drawn: (1) that the county superintendent dominates in most of the functions studied; (2) that the principal tends to have greater responsibility as the size of the school increases. Other data show that the school principal, especially in the larger schools, compares favorably with the county superintendent in length of training and in amount of training in school administration. While the typical county superintendent has had a larger experience than the typical principal, the latter has usually had enough to make him familiar with the details of school administration. In view of these and similar data, the suggestion is made that the tendency in Virginia should be to give more responsibility to the principal in the direction of his school, thus leaving the county superintendent free for larger problems of educational leadership in his territory.

- E. N. Ferriss—Secondary education in country and village. (Book.)

The purpose of this book is to present, from both the psychological and the sociological aspect, the guiding principles of secondary education in a democracy, and to indicate their bearing upon the work of the small secondary school. In Part I a point of view is suggested and statistical material is presented to show the present status of secondary education in rural and village communities. In Part II are presented the theory of aims, objectives, materials, and means in secondary education, and the problems relative to the small secondary school. In Parts III to V the problems of internal organization of the small secondary school are taken up, together with such broad aspects of the problem of secondary education in rural and village communities as general administration, supervision of instruction, growth of teachers in service, cooperation between school and community, and the school and the adult.

- C. B. Moore—Background for every teacher. New York State education, April, 1928.
An analysis is given of certain desirable traits in a teacher which are not readily revealed by formal rating systems.

- C. B. Moore—The rating of teachers as one means of supervision. In Report of regional conferences of district superintendents. State Department of Education.
This paper presents the more recent developments and technics in teacher rating as applied to rural-school situations.

- C. B. Moore—Junior high school citizens. Elementary school journal, September, 1927.

This is a critical study of 350 junior-high-school students with respect to their concepts of good citizenship.

- E. L. Palmer—Field and laboratory work in nature study. The classroom teacher 5:377-494.

- E. L. Palmer—Reptiles and amphibians. Camp cookery for field trips. The classroom teacher 9:127-132, 415-466, 619-634.

- Arthur Newton Pack and E. Laurence Palmer—The nature almanac. A handbook of nature education. (Book.)

This book contains a nature calendar making suggestions for observational work month by month throughout the United States; a survey of the stated aims of associations and clubs interested in the promotion of nature education, this being a record of aims and accomplishments of thirty-three organizations interested in this phase of educational work; a brief survey of practices in training nature teachers in normal schools and teachers' colleges—a questionnaire survey based upon returns from thirty-four teacher-training institutions graduating 8851 students, 98 per cent of whom expect to teach in elementary schools; a collection of stated aims of various other organizations interested in training nature leaders; a survey of aims and practices in nature education in 179 summer

camps; a school nature outline, offering a summary of nature outlines in use over the country and a suggestive outline for the first six grades, organized for use in rural as well as in urban schools; a nature bibliography covering materials of use throughout the country; a nature education survey of the United States, showing the status of nature education in each State of the Union and its possessions.

R. M. Stewart—Constructing the agricultural part of the high school curriculum at Trumansburg, New York. Nat. Soc. Study of Ed. Yearbook 26:176-182.

Rural Engineering

The research members of the Department of Rural Engineering, in cooperation with the Department of Farm Practice, are now devoting their main attention to studies of power farming under New York conditions. The present-day powerful and reliable tractor, with its "power take-off" shaft for supplying engine power to drive the mechanism of any implement drawn by the tractor, is being extensively used in other agricultural regions. It is highly desirable that the Experiment Station should keep thoroughly abreast of the changes which the "power take-off" makes possible in farm procedure, and obtain accurate data concerning them. Time and cost studies of power farming on the college farms were conducted last year and will be continued.

The small combined harvester-thresher is invading the East, and two models were studied on the college farms during the harvest of 1927. The use of these machines by other growers in the State has already indicated that artificial drying of the "combined" grain will very often be necessary if the maximum results from the machine are to be secured. Drying experiments indicated that heat, short distances of air travel through the grain, and deliberation in treatment, are all required.

The studies of poultry-house ventilation are indicating that the application of duct ventilation is not so evidently advantageous for this purpose as is its application to the removal of moisture from dairy stables. The size of the flock in each house is to be progressively increased as the studies are continued.

The milk-house investigation will be concluded with the preparation of designs of thermally insulated cooling tanks, and the material will then be incorporated in bulletin form to make it available for the many farmers who need to build new milk houses.

To make the dairy-barn-ventilation findings practically available to the dairy farmer with little capital, work is being pushed on the design of an adequate and durable type of out-take air flue which can be built of local materials by local labor. The designs are completed, and a trial flue will be constructed before the data are given to the extension men for dissemination. The importance of this whole investigation to the dairy industry is apparent.

Rural Social Organization

The history of the investigations of the Department of Rural Social Organization was given in the report of the College for 1926-27. During the past year three memoirs were published, one of which comprised a survey of sickness in rural areas of Cortland County, New York. The

facts obtained in this survey, concerning the evidence and the cost of sickness, will be used by the newly formed National Committee on the Cost of Medical Care, which is beginning an exhaustive study of the whole problem and is undertaking similar surveys in various typical areas.

During the year a memoir entitled *Rural Population of New York 1855 to 1925*, was prepared for publication and has been printed. The findings of this study were summarized in last year's report. The next section of the same project has now been completed. The report of this work describes the functional characteristics of various classes of village according to their population, particularly with regard to their economic and social-service agencies and institutions. Thus, with regard to their economic functions, villages in rural counties fall into five distinct classes, with the following ranges of population: under 250, 250 to 749, 750 to 1249, 1250 to 1749, and 1750 to 2249. Villages with a population between 2250 and 2500 have more of the characteristics of towns of more than 2500 population than of villages under 2250. In general, each class of villages shows an increasing and characteristic specialization in its economic functions. Villages of 250 population or less are characterized by only the primary social and economic agencies, such as the general store, the church, the school, the grange, and local units of farm and home bureaus; and their economic agencies tend to decrease more rapidly than their social life. Such institutions as high schools, banks, newspapers and libraries are usually found only in villages of 750 population or more and are commoner in villages of over 1000. There is a very high coefficient of correlation (+0.72) between the number of economic agencies and the village population, and a similar coefficient of +0.77 for the number of professional persons and the population; but the number of churches bears very little relation to the population. A series of maps shows the geographical distribution of various social organizations such as granges, libraries, and lodges, and professional services such as those given by physicians. Educational and socio-educational organizations are more frequent in the villages of the farming counties than in those of the same size in urban counties, and are more stable in the villages of the farming counties. In all villages recreational facilities are relatively inadequate.

Another section of this study of the rural village in relation to rural population consists of a statistical analysis of the rural population of Tompkins and Schuyler Counties, as obtained by the State Census of 1925. The data from the original schedules have been punched on cards for sorting in the tabulating machine. This study is more than half completed and will give additional information as to the population characteristics of unincorporated villages as contrasted with incorporated villages and farms.

Two other studies of rural areas in Tompkins County are in process of preparation for publication, the first a sociological analysis of the community of Dryden, and the second a study of the town of Caroline, mentioned in last year's report. In addition, a thorough sociological study of the rural communities in Schuyler County has been made.

At the request of a local committee at Waterville, Oneida County, the department cooperated in a survey of that community and made a analysis of the population of the two towns in its territory from the data

of the 1925 State Census. A general report was published in the local paper, and that report is being considered by a local committee as the basis for a program of community development.

Three new research projects were started during the year, under funds from the Purnell Act. Two of these are under the direction of Dr. R. W. Nafe, who last fall took charge of research work in the social psychology of rural life. The two projects in which he is engaged are studies of rural leadership, and studies of group conflict in rural communities. Most of his time during the past year has been spent in the leadership study, first in reviewing all available literature concerning the psychology of leadership, and then in obtaining case records of the history of individual leaders. A good beginning has been made in obtaining case records, and their accumulation will form the chief work of the coming year. The study of group conflict has not been actively prosecuted, but the problem has been analyzed, methods of study are being considered, and active work will be begun during the coming year.

The third new Purnell project is a study of rural-community areas in New York, which is being made in cooperation with the Bureau of Agricultural Economics of the United States Department of Agriculture. This study will be similar to that made in Otsego County in 1922, in so far as it will attempt to map and describe the rural-community areas of the counties studied, and to give a sufficient volume of evidence upon which to base conclusive generalizations with regard to the various types and functions of rural communities. The more fundamental objective of the study, however, is to ascertain whether, with good roads and automobiles, there is a tendency for the competition of the cities and larger towns to weaken the social and economic life of the smaller villages, and thus to break down the smaller rural communities and merge them in communities of larger area centering in larger villages. This study has been begun in Broome and Onondaga Counties by means of questionnaires circulated through the mail to every rural householder, of which 40 per cent have been returned. The study is to be extended to Wayne and Monroe Counties, which will be covered by a personal survey made by representatives of the department. The analysis of this large volume of data will require at least the coming year, and should give results of fundamental importance in the answer to many rural problems.

Thus, for example, in his last message to the Legislature the Governor of New York recommended the creation of a commission for the study of county government with a view to its reorganization. Any reorganization of county government must involve a consideration of the towns and incorporated villages, and should consider the possibility of some better form of local rural municipality than now exists; and it must also be based on a knowledge of the social and economic relations of the areas concerned. These data will be available from the studies now in process for the counties surveyed. The data will also be of very practical value in outlining centralized school districts, as was demonstrated in the study made of the Waterville community, mentioned above. Finally, the study should give important information on many points with regard to the much-discussed problems of urban-rural relations and of public policies with regard to the maintenance of various types of public and private institutions in villages and the areas essential for their support.

Through a grant made by the Laura Spelman Rockefeller Memorial the College has been able to employ an assistant to aid in making a thorough review and analysis of the contribution which sociology as a science has made and may make to the problems of the family, particularly with regard to education for parenthood and the technology of family development. This study is practically completed, and will indicate fields and methods of research concerning the sociology of the rural family. On the basis of this study a concrete sociological study of the rural family will be undertaken during the coming year.

Nearly related to this study is an investigation of the divorce rate in four rural counties, Tompkins, Schuyler, Tioga, and Cortland, covering the original records from 1916 to 1925. Previous studies have shown that both the highest and the lowest divorce rates in New York are in certain of its rural counties. The records of the four counties studied show that there are practically twice as many divorces granted to urban as to rural people, and show also the inaccuracy of the statistics of the United States Census on divorce and the importance of some legislation which will make possible the accurate recording of essential statistical information regarding divorces, similar to that now gathered by the State for births, deaths, and marriages. This study will be carried further in some of the counties in the State having the highest and the lowest divorce rates, and the situation in New York will be compared with that in several other States. In a few States data are available which will make possible a statistical analysis that may throw much light on the conditions making for a high or a low divorce rate, and their localization in rural counties. A preliminary study of divorce rates in Iowa has already been made, which gives promise of indicating the method of study.

During the past year the head of the department has assisted in the Advisory Committee on Social and Economic Research in Agriculture of the Social Science Research Council in making a survey of research work in rural sociology throughout the United States, and with three other rural sociologists has prepared a mimeographed report which discusses rather fully the present status of methods and administration of research in rural sociology in this country. The work of this committee, in conjunction with other efforts, has resulted in a grant from one of the foundations of \$30,000 a year for five years for graduate fellowships in agricultural economics and rural sociology, which is administered by a national committee and which will do much to aid in the training of research workers in these fields.

The department has outlined a program of research work in rural life showing many problems of importance awaiting investigation, which will be attacked as rapidly as funds and personnel are available. Scientific research in this field is new, and, necessarily, if it is sound it will be slow, although no more so than in other fields of scientific research. It is believed, however, that results already obtained presage a larger and a better product as better methods are discovered and more and better trained workers add to our body of knowledge.

The following papers by members of the staff have appeared during the year:

Dwight Sanderson—Scientific research in rural sociology. *Amer. journ. sociology* 33:177-193. 1927.

This paper, which was presented at the Institute of Research Methods in Rural Sociology held at Purdue University in April, 1927, is a critique of the methodology of rural sociology and of general sociology. It challenges the prevailing conception that rural sociology should be primarily a technology of rural welfare, and outlines the essentials of a science of sociology. It distinguishes the sciences of sociology and social psychology from the technology of rural social organization, and indicates the fields of each.

Dwight Sanderson (editor)—Farm income and farm life. *Amer. Country Life Assoc.*, 1927, p. 324.

This volume was edited by Dr. Sanderson as chairman of a joint committee of the American Country Life Association and the American Farm Economics Association, and consists of a symposium on the relation of the social and economic factors in rural progress. Although not strictly a piece of research, the planning of the symposium involved a considerable amount of research into the existing body of knowledge upon the subjects involved, and many of the papers obtained and published form original contributions to this important topic. This book formed the basis of the program of the Tenth National Country Life Conference, and has been widely used in discussion groups.

Dwight Sanderson—A population study of three townships in Cortland County, New York. *Cornell Univ. Agr. Exp. Sta. Memoir* 111. 1928.

This memoir was a by-product of Memoir 112, *A Survey of Sickness in Rural Areas in Cortland County, New York*. It shows the abnormal number of older people in rural villages, and the small number of youths and young married people. It gives indices of the mobility of the rural population, and shows the high percentage of local nativity, the marital state, and the size of family, for villages and the open country, in the townships studied.

Dwight Sanderson—A survey of sickness in rural areas in Cortland County, New York. *Cornell Univ. Agr. Exp. Sta. Memoir* 112. 1928.

This memoir reveals the relation of the incidence of sickness to the age groupings in rural villages and the open country, enumerates the total amount and kinds of sickness by ages for all families in the three townships studied for a calendar year, and gives the cost of medical care and of expenditures for health. It gives striking evidence of the necessity of correcting statistics of this sort for the difference in age groupings in different populations. Particularly significant is the amount and cost of medical care in confinement cases as related to infant and maternal mortality. The total amount paid to local physicians for medical service is summarized by townships, and it is shown that the volume of business is insufficient to support a local physician, but that in some cases medical service to the farmer is much greater than to the village or city family, though he is less able to pay the higher cost. This study and a similar one in Ohio, made simultaneously, are the first which give the facts of the amount and cost of sickness in rural communities, and give important data for the study of the cost of adequate medical care.

Dwight Sanderson—Report of the Committee on Teaching Rural Sociology. *Second International Country Life Comm. Proc.*, Bul. 5. 1928.

Dwight Sanderson—The relation of the farmer to rural and urban groups. *Amer. Sociological Soc. Pubs.* 22. 1928.

Dwight Sanderson—Waterville community survey report. *Waterville [New York] Times*, May 17, 1928.

Vegetable Gardening

During the past year active research work has been conducted by the Department of Vegetable Gardening on nineteen projects, three of which were started during the year. The new projects are: (1) a study of the value of ethylene gas for the blanching of celery and the ripening of

tomatoes; (2) a study of the ecological and other factors affecting seeding, (bolting) of onion sets; and (3) a study of the effects of pruning back young plants on plant response, and the factors involved. Progress has been made on all of the projects, and papers giving brief summaries of results on some of them have been published during the year, as noted below:

E. V. Hardenburg—Muck-soil reaction as related to the growth of certain leaf vegetables. *Plant physiol.* 3. 1928.

Lettuce, mustard, endive, and parsley were grown in pot cultures of low-lime muck soil having an initial pH of 5.0. Sulfur, aluminum sulfate, and calcium carbonate were applied in varying acre applications to provide a range in hydrogen-ion concentration from pH 4.0 to pH 7.0. The high colloidal complex of the muck provided so much buffer effect as to prevent as great a range in hydrogen-ion concentration as would be expected from similar treatments of mineral soil. Sulfur proved more effective than aluminum sulfate as an acidifying agent. No trace of aluminum toxicity appeared even from the 8000-pound application, this being explained by the fact that the buffer effect of the muck prevented sufficient acidity to render the aluminum soluble in toxic quantity. The pH-range optimum for top growth was, for lettuce 5.0 to 6.5, for mustard 4.5 to 7.0, for endive 5.0 to 7.0, and for parsley 5.0 to 7.0. Contrary to public opinion, lettuce appears to be less sensitive to relatively high acidity than are endive and parsley. There was no consistent correlation between hydrogen-ion concentration of the soil extract, and root and top ratio, in lettuce, mustard, and parsley. Endive root growth was favored by a culture medium approaching alkalinity. Ash analysis of lettuce leaves showed that increased application of either sulfur or aluminum sulfate did not increase the amount or the percentage of these materials absorbed. Increased application of lime resulted in a decreased absorption of aluminum oxide, iron oxide, and calcium oxide, due to the probable effect of the calcium on the absorptive power of the cell membrane. The highest water requirement of all four vegetables was found to be in the most acid cultures.

P. H. Wessels—Potatoes and soil acidity. *Amer. potato journ.* 5. 1928.

This paper contains an account of work carried on during 1926 and 1927 to determine the range of soil reaction best suited for the growth of potatoes. The potatoes of the Irish Cobbler variety in 1926 were free from scab on all plots, the range of reaction being from pH 4.7 to pH 6.6. The natural reaction of the soil was about pH 5.3. Increasing this acidity decreased the yields of potatoes, the decrease being very marked on the more acid plots. Decreasing the acidity had but little effect upon the yields.

With the Green Mountain variety in 1927, scab was found on nearly all of the plots, though the amount was small where the reaction was more acid than pH 5.6. Where the reaction was less acid than pH 5.6, the amount of scab increased as the acidity decreased. The vines remained green several weeks longer on the less acid plots, but any increase in yield that might have resulted from this longer growing season was offset by an attack of late blight which caused considerable loss from rot.

A reaction of about pH 5.5 or 5.6 appears to be approaching the limit for the production of scab-free Green Mountain potatoes on this soil. Where the soil is more acid than this, the yield may be increased through the proper use of lime; but such use of lime should be based upon a knowledge of the reaction of the soil and of the amount of lime needed to bring about fairly definite changes in the reaction.

H. C. Thompson—Experimental studies of cultivation of certain vegetable crops. *Cornell Univ. Agr. Exp. Sta. Memoir* 107. 1927.

Results of studies of the effects of cultivation on six vegetable crops carried on at Ithaca, New York, on a Dunkirk gravelly sandy loam soil for six years, are reported. The yield data show conclusively that the main benefit derived from cultivation was through weed control. The percentage increase from cultivation as compared with scraping to keep down weeds, was as follows: for carrots, 2.7; for beets, 4.25; for onions, 7.7; for cabbage, 0.0; for celery, 24.0; and for

tomatoes, 1.01 for both trained and untrained plants. The odds of significance, calculated by Student's method, show that the difference in yield under the two treatments was not significant with carrots, cabbage, and tomatoes. Celery is the only crop of the six used which showed large (19 to 31 per cent) and consistent increase due to the soil mulch. Eliminating the weeds increased the yield of beets 550 per cent, as compared with 4.25 per cent increase due to the maintenance of a soil mulch.

Moisture determinations made approximately two weeks apart during the growing seasons of 1921 to 1925, indicate that a soil mulch does not always conserve moisture, but may result in actual loss. When the soil was cultivated soon after a light rain (one-half inch or less), there was a loss of moisture due to the cultivation. Even where the soil mulch conserved soil moisture, it did not always follow that the yield was larger on the cultivated than on the scraped plots.

The temperature of the soil at depths of 3 and 6 inches, in both the cropped and the uncropped areas, averaged higher in the scraped than in the cultivated plots throughout the growing seasons of 1923, 1924, and 1925. This was true both in the plots where beets were grown and in the uncropped plots.

Data from nitrate-nitrogen determinations on soil samples taken to the depth of 18 inches, made every two weeks during the growing season, indicate a slight advantage for the soil mulch as shown by a comparison of the cultivated and the scraped fallow plots. With the cropped plots the differences in nitrates between the cultivated and the scraped plots were not significant except with the crop of trained tomatoes, where the cultivated soil averaged higher than the cropped soil. In this case, however, the higher yield of fruit was produced on the scraped plots.

Studies of the root systems of the several crops made at various stages of growth of the plants, show that those crops having the most widely spread and the best-distributed root systems were benefited least by the soil mulch.

C. Thompson—Environmental factors affecting seed-stalk development in celery. *New York Hort. Soc. Memoir* 3:273-276. 1927.

This paper summarizes the results of studies carried on for four years, on the effects of temperature on premature seeding in celery. The data show that exposing young celery plants to temperatures averaging from 45° to 50° F. for fifteen to thirty days, results in their going to seed within two months after they are set in the field. Similar plants held at an average temperature of 60° F. until set in the field do not go to seed under the same conditions. Experiments conducted under control conditions have shown similar results. High temperature, averaging 70° F. or more, prevented seed-stalk development unless the stalks started before being placed under this temperature. Prolonged exposure (from two to three months) to temperatures averaging about 55° F. also resulted in premature seeding. Exposure to lower temperature (45° F.) for fifteen and for thirty days hastened seeding of plants kept at 55° F. for the remaining period of growth.

C. Miller—Effect of high temperature on character of growth of cabbage. *Plant physiol.* 3:95-96. 1928.

Full-grown plants with solid heads were brought from the field on October 8, 1925, and some were placed in a warm greenhouse (70° F.) and others in a cool greenhouse (60° F.). All of the plants in the cool house developed seed stalks and flowers in one hundred and fifty-four days, while none of those in the warm house produced seed stalks, but they continued vegetative growth and by March 7, 1926, all of them had developed heads.

As none of the plants in the warm house had produced seed stalks, a few were kept for further observation. About June 10 the heads cracked and vegetative growth continued. This vegetative and heading process continued, and by September 15, 1927, the fifth head was fully mature and the plant had reached a height of more than eight feet.

The Long Island vegetable research farm

The experimental work carried on at the Long Island vegetable research farm during the past year was a continuation of that previously started.

These paragraphs give a report of progress on the experiments being conducted with reference to soil fertility, soil reaction, and vegetable production. Results of studies in entomology and plant pathology are presented in the report of the State Experiment Station at Geneva.

Soil-fertility experiments. In the spring of 1923 an elaborate experiment was laid out for the study of fertilizers for tomatoes. Due to disease, it has been necessary to grow other crops on these plots every other year so that results for only three years are available for tomatoes. These will be summarized for publication during the year 1928-29. In the spring of 1928 another series of plots was laid out to duplicate treatments used in the tomato fertilizer experiment. Tomatoes were grown on this series of plots, and potatoes on the original series.

Asparagus fertilizer experiments are showing that nitrogen increases the yields more than does either potash or phosphorus; but since this was only the second full season of cutting, definite recommendations are not justified.

Cultivation experiments. Cultivation experiments carried on for six years bear out the findings reported by Dr. H. C. Thompson in Memoir 107 of this station, published last year, that weed control is the chief advantage derived from cultivation. These experiments duplicate those carried on at Ithaca, as it seems desirable to determine the effects of cultivation on different soil and under different climatic conditions. Potatoes and cauliflower have been added, these being important crops on Long Island.

Paper mulch is being tested on a small scale in comparison with ordinary cultivation.

Sweet-corn suckering. The experiments on removing suckers from the sweet-corn plant have been continued for six years. The results are similar to those obtained in experiments at Ithaca and published two years ago in Bulletin 450 of this station. Removing the suckers has shown no gains to offset the added expense. In connection with this work, progress is being made in an attempt to develop non-suckering strains of Long Island Beauty. Results of the suckering experiments are being summarized for publication.

Soil-reaction studies. Soil reaction is a very important factor on Long Island, where potatoes and cauliflower are the two major crops. A series of plots is maintained on which the soil reaction has been changed by applications of varying quantities of sulfur and lime. The results of the studies of soil reaction on the yield and the quality of potatoes have been published. An abstract of this paper is given elsewhere in this report.

The results of studies on cauliflower show very marked reduction in yield as the acidity increases. Practically no marketable crop is produced on the most acid plots, except where heavy applications of phosphoric acid are used. There is indication that the soil reaction may be adjusted so that potatoes and cauliflower can be grown successfully on the same soil, by using superphosphate (acid phosphate 16 per cent) on the cauliflower at the rate of 1500 to 2000 pounds to the acre.

Cover crops and green manures. Studies of the effects of various kinds of cover crops and green manures are being made on two series of

plots, but no definite results in yields of vegetable crops have been obtained.

Size-of-plot studies. Studies on size of plots and number of replications necessary for reliable results have been carried on since 1923. Two blocks of nearly three acres each have been devoted to this study. The results have been tabulated and studied in order to determine the best layout of plots. One block was laid out for soil-fertility studies in the spring of 1928. Studies are being continued on the second block so as to get a reading with several crops. The data already obtained will be studied, summarized, and made available for publication during the coming year.

Miscellaneous experiments. From time to time questions arise which can be answered by carrying out relatively simple experiments which require little attention but which are of great interest to growers. When these cannot be answered from experiments already under way, small blocks of land not used in the large experiments are employed for these simpler ones. Such studies include variety and strain tests of the important crops, especially comparing new or so-called new varieties with well-known standard varieties. Another study which may be given as an example is that in connection with crow repellents. For the past three years, studies of the effects of various compounds recommended as crow repellents, on germination and on yield of marketable corn, have been made. Results of two years of this work were published in the *Farm Bureau News* of Nassau and Suffolk Counties.

THE STATE EXTENSION SERVICE

The extension service has moved forward during the past year with its customary vigor. Long-term programs in which progress is best measured over a period of years continue to receive major attention by subject-matter extension specialists and county agents. The alfalfa-clover campaign, reforestation, replacement and upbuilding of dairy herds following tuberculosis eradication, are examples of projects which will require many years of constant effort for completion. Results may at times seem slow to the enthusiastic instructor, through delays occasioned mainly by inadequate financial resources. The long view, however, reveals remarkably prompt adaptation to rapidly changing economic, transportation, and marketing conditions.

Short-term or emergency projects to meet unexpected conditions of weather, outbreaks of disease and insect pests, and the like, annually call for some realignments and temporary shifting of emphasis. In the field of disease and insect control, the extension service has for many years been so organized through what has become known as the "spray information service" as to prevent serious losses by prompt revisions of spray schedules and materials to suit requirements.

One interesting development of recent years which seems likely to acquire increasing significance lies in the cooperation being established between the extension service and the agricultural departments of the secondary schools. These local community institutions have been able to reach boys and young men not generally touched by the extension pro-

grams. The College has in many instances furnished instructors for the short courses offered to this group of young farmers by the state schools, and, in so doing, is bringing the latest and most scientific information into many farm homes by the only open avenue; and, most important of all, the College is thus reaching and encouraging young and vigorous rural leadership which will presently bear rich fruit.

Certain activities or projects involving several subject-matter departments are best reported in summarized form, in the following pages. These serve also as a general introduction to the more specialized reports which follow. In addition, there are certain administrative functions to which attention is drawn in the several succeeding paragraphs.

Extension schools. There seems to be a tendency on the part of farmers to swing back to the longer, more intensive units of instruction as offered in the schools of from two to five days duration, in spite of the increasing numbers of other types of meetings held. Even by employing several additional assistants last winter, it was not possible to meet all the requests for tractor schools. There are on file, at the end of the present year, at least a dozen requests for these schools to be held during the winter of 1928-29. Poultrymen also are calling more insistently for two-day and three-day schools, while the number of five-day schools could be more than doubled if broader programs involving two or three departments were offered. As mentioned in former reports, however, this general-type school does not seem desirable from the standpoint of good teaching.

The total number of schools of two or more days duration held during the past winter was 43, with a total enrollment of 1434. The average attendance per session, which always runs somewhat under the average enrollment, was 25.86. Of the total number of schools only 15 were of five days duration, and all of these were tractor schools. There were 24 three-day and 4 two-day schools. One interesting aspect of the extension schools is that 9 of them were wholly or partly arranged by state or high-school teachers of agriculture in cooperation with the county agents, were generally held in the high-school building, and were attended more or less regularly by boys of school age or a little beyond.

Lectures and demonstrations. Variations from year to year in the total number of extension meetings with lectures and demonstrations, and in the total attendance, are interesting though not especially significant. Compared with last year the number of method demonstrations held was about 10 per cent more, while the total attendance showed a 25-per-cent increase. There were one-third more demonstration meetings, with about a corresponding increase in total attendance. The number of lectures given was about the same. The total number of teaching contacts through all types of meetings was 404,839 this year as compared with 442,025 last year. The difference is found mainly in the decreased number of direct contacts made this year by administration officers.

Farm and home institutes. During the winter of 1927-28, there were 75 farm and home institutes held in 11 counties. The total attendance was 4121, or an average of 55 per session. This type of meeting differs very little from certain other methods commonly employed, and.

SUMMARY OF EXTENSION SPECIALISTS' FIELD ACTIVITIES FROM JULY 1, 1927, TO JUNE 30, 1928

REPORT OF THE DEAN

Department	Days in field	Method demonstrations		Demonstration meetings		Training meetings		Num-ber of farm and home visits	Conferences		Lectures		Miscel-laneous (number of days)	Number of teaching contacts
		Num-ber	Attend-ance	Num-ber	Attend-ance	Num-ber	Attend-ance		Num-ber	Attend-ance	Num-ber	Attend-ance		
Agricultural Economics.....	348	4	53	14	248	....	....	354	67	1,990	278	15,080	33	17,725
Agronomy.....	346	....	....	8	493	....	....	1,048	52	2,307	252	7,379	19	11,227
Animal Husbandry.....	624	297	77,388	46	998	....	....	570	117	633	521	18,765	17	98,354
Dairy Industry.....	174	31	119	....	....	....	....	30	85	2,735	36	2,318	71	5,202
Entomology.....	181	19	725	47	2,264	2	35	452	100	620	69	11,186	10	15,282
Floriculture and Ornamental Horti-culture.....	83	....	....	11	329	....	....	65	89	249	60	3,728	26	4,371
Forestry.....	190	33	425	68	1,055	2	33	251	72	416	84	4,151	11	6,381
Plant Breeding.....	254	40	817	4	133	....	....	575	38	341	64	1,988	47	3,854
Plant Pathology.....	228	64	3,352	....	....	....	....	510	56	446	84	3,674	36	7,982
Pomology.....	177	131	1,917	26	311	....	....	250	37	260	106	8,232	7	10,970
Poultry Husbandry.....	605	347	7,530	29	697	1	15	541	74	549	320	9,723	57	19,055
Rural Education.....	14	....	....	....	....	....	....	....	....	....	13	1,645	1	1,645
Rural Engineering.....	670	1,041	18,122	2	9	....	....	248	18	300	14	1,020	24	19,699
Rural Social Organization.....	212	20	1,503	17	828	169	6,119	2	83	2,220	57	5,222	3	15,894
Vegetable Gardening.....	254	20	594	2	405	1	35	361	158	1,012	162	10,286	36	12,693
Miscellaneous.....	223	....	....	....	....	....	....	12	....	....	123	15,773	144	15,785
Total agriculture.....	4,583	2,047	112,545	274	7,770	175	6,237	5,269	1,046	14,078	2,243	120,170	542	266,069
Home Economics.....	1,011	394	19,650	156	4,329	291	4,087	352	810	3,304	350	19,924	44	51,646
Total specialists.....	5,594	2,441	132,195	430	12,099	466	10,324	5,621	1,856	17,382	2,593	140,094	586	317,715
Total administration.....	1,378	....	....	....	....	146	4,093	....	1,948	10,705	720	72,326	100	87,124
Grand total.....	6,972	2,441	132,195	430	12,099	612	14,417	5,621	3,804	28,087	3,313	212,420	686	404,839

for purposes of comparing one year with another, should be grouped with lectures and demonstrations.

County fairs. A committee made up of several administrative officers and extension specialists at the College assisted the State Commissioner of Agriculture and Markets in formulating further recommendations for premium-list revision and judging at county fairs. The effects of these changes will not become fully operative for several years, but they are designed to encourage the amateur rather than the professional exhibitor and to place greater emphasis on quality of standard varieties and grades.

Demonstrational judging of certain classes of exhibits at 46 county and community fairs in 38 counties consumed 140 man-days during the autumn of 1927. In most cases such judging is done as a demonstration, which exhibitors attend very closely and with increasing interest as is evidenced by a steadily increasing demand for such service. The requests are invariably cleared through the county agent, and are sorted carefully to eliminate situations in which the demonstrational feature is likely to be lost.

In addition to the judging of exhibits, the Department of Animal Husbandry operated a dynamometer, or horse-pulling machine, at 8 county fairs and at the State Fair.

Indian extension service. Agricultural extension teaching on the Indian reservations continues along the lines begun several years ago. Promising youths from each reservation attend the winter courses at Cornell, and, on returning to their reservations, become local project leaders for securing the adoption of improved agricultural practices. The effectiveness of one such leader was amply demonstrated during the corn-borer campaign, in which his reservation "cleaned up" with a promptness and thoroughness not excelled by any other community in the area.

The leader of the Indian extension-service project has been in great demand for county-wide and community meetings of an inspirational character designed to create and foster local pride and renewed faith in country life. Attendance at these meetings has been uniformly large, and keen interest has been shown. In a few counties, historical tours have been conducted. These have served to bring together urban and rural groups on a common plane of mutual interest and with a sense of relationship both past and present.

State Fair exhibit. The College had several very timely subject-matter exhibits in the State Institutions Building at the State Fair. The corn-borer exhibit attracted special attention. This was held jointly with the United States Department of Agriculture, and was in two parts: one showing, by charts, by photographic specimens of the borer and damaged stalks, and by corn in several stages of growth, the life history of the borer, times of infestation, and recommendations for control, and the other having particular reference to field methods of control. Actual machinery, including a corn harvester with low-cut attachment, a stubble beater, and walking and tractor plows with chain and rod attachments for properly turning under stubble, was shown. A section of a cornfield was transplanted to allow these machines to be shown as if in actual operation.

A large map of the United States, with light-flashing attachment, showed the spread of the corn borer since the first infestation in 1917.

"Why gamble with poor seed?" was the central theme of the plant-breeding exhibit. A large wheel in motion, carrying comparisons of yield of ordinary varieties of grain and grasses with the better recommended varieties, made one realize the folly of using poor seed. Samples in seed and sheaf form gave opportunity for more careful study.

For the dairy farmer, two exhibits were of interest: one showing methods of handling milk with special emphasis on cooling, and the other relating to continuous pastures as a prime factor in milk production. In the former, a small brine cooler was in operation and charts showed comparisons between this method and other farm methods of cooling milk. Models and plans of farm milk houses also were shown. In the exhibit on pastures, a map of the State was used showing the pasture regions as designated by the dominant variety of pasture grass growing in each region, along with samples of pasture grass, photographs of good and poor pastures, and general recommendations for pasture improvement.

In the forestry exhibit, a cross-section of a farm woodlot, with actual trees, was used to point out the undesirable weed trees that should be eliminated from the average woodlot. A guessing contest on naming the varieties shown was carried on throughout the week.

As a result of the experimental work at the College on using sunlight, ultra-violet rays, and cod-liver oil to increase egg production and to strengthen the eggshell, the Department of Poultry Husbandry had an exhibit to show the effects of these treatments in such a way that the poultryman could see their importance. Live fowls taken from the experimental pens, with records shown by charts and photographs, helped to drive home these new and important discoveries in the poultry field. To emphasize the need of strong-shelled eggs for shipping, the College used a working sledge-hammer which exerted a pressure of sixteen pounds on an egg every ten seconds. The thin-shelled eggs would break immediately, while the strong-shelled eggs would resist for several hours.

To show the fruit grower how to work over undesirable varieties of apples and to save trees from rodent and other injury, the pomology exhibit displayed six growing apples trees that had been grafted in the preceding spring. These trees were from six to eight years old and were transplanted in large tubs so that visitors could observe the actual results. Demonstrations of the various forms of grafting were carried on several times each day.

Farm and Home Week. What has been known for the past twenty years as Farmers' Week has now become Farm and Home Week, and the twenty-first annual gathering of farmers and farmers' wives, and others interested in agriculture and homemaking in all of its broad phases, was held at the Colleges of Agriculture and Home Economics on February 13 to 18, inclusive, 1928.

The program was, in the main, similar to those of previous Farmers' Weeks, with the usual variety of timely lectures, demonstrations, exhibits, and contests, all emphasizing the very latest in subject-matter information and giving the Farm and Home Week guests opportunity to discuss with those in charge problems and questions of timely importance

in their various occupations. The staff of the State Experiment Station at Geneva took a very active part in the proceedings, twelve of its members being on the program. Among the speakers representing other institutions or organizations were: Paul Brooks, State Deputy Commissioner of Health; Dr. Louis I. Harris, Commissioner of Health of New York City; Berne A. Pyrke, State Commissioner of Agriculture and Markets; J. Cayce Morrison, of the State Department of Education; M. A. Dawber, of Philadelphia; S. J. Brownell, of the Pennsylvania State College of Agriculture; D. C. Kennard, of the Ohio Agricultural Experiment Station; Jennie Buell, of Ann Arbor, Michigan; R. R. Graves, of the United States Department of Agriculture; Alfred Vivian, Dean of the Ohio State College of Agriculture; Edward Breck, of Washington, D. C.; Alfred Atkinson, President of the Montana State College of Agriculture; Carl Stanton, of Peterborough, New Hampshire; Grace Cornell, of the Metropolitan Museum of Art, New York City; Nellie Tayloe Ross, former Governor of Wyoming; and W. O. Thompson, former President of the University of Ohio.

The first state-wide dramatics contest was held this year. The county and inter-county contests had been held during the summer and fall. Representative groups from the four sections of the State competed in this final contest, which was staged in the University Theater. The communities competing were: Sinclairville, Chautauqua County; Redfield, Oswego County; Veteran, Chemung County; and New Paltz, Ulster County. The first place was taken by Redfield, and the second place by Veteran.

One of the newer features of Farm and Home Week is the judging contests provided for teams from high-school departments of agriculture. This year these contests were with milk, poultry, potatoes, apples, and livestock. There were teams from 31 schools entered in milk judging, from 36 schools in poultry judging, from 34 schools in potato judging, from 31 schools in apple judging, and from 37 schools in livestock judging. A banquet was given in Willard Straight Hall for the 374 entrants in these contests.

The registration for 1928 was approximately the same as that for 1927, when a record attendance was reported. This year the actual count of visitors was 5061 as compared with 5175 for 1927. The registration from Tompkins County was 1952, with 885 from the city of Ithaca and 1067 from other parts of the county. Tioga County had 301 registered and Schuyler County had 290, representing a considerable increase over former years. The next five highest enrollments were: Cayuga County, 227; Cortland County, 241; Chemung County, 170; Ontario County, 116; and Onondaga County, 107.

In the occupational division, 3322 persons indicated their occupations. Of this number, 1318 were designated as farmers, 784 as homemakers, 194 as teachers, 230 as students outside of Ithaca, 127 as extension workers, and 13 as state and government workers. Of the total registration, 2569 indicated that they had attended previous Farmers' Weeks.

Junior Field Days. The seventh annual Junior Field Days were held at the State Colleges of Agriculture and Home Economics on June 25, 26, and 27. The enrollment at Junior Field Days continues to increase.

This year there were 2144 present, as compared with 1925 last year. Of this registration, 1307 were girls and 837 were boys. This increase made it impossible to house all in the university dormitories, and accommodations for 45 boys and about 70 girls were found in private houses — a condition which may necessitate some limitations on attendance.

The program this year followed the same general arrangement as last year, with lectures and demonstrations during the forenoons, and contests, trips, exhibits, and recreational features during the afternoons. Fewer general assemblies were held, and the evening programs were so arranged as to allow the youngsters to get to their rooms by nine o'clock, standard time. Considerably more interest was shown this year in the various contests. In the milking contest there were twenty entries, the winner being Harold Haswell, of Rensselaer County. In swine judging twenty contestants entered, and the winner was Joseph Sutton, of Onondaga County. Fourteen entered the sheep-judging contest, which was won by Melvin Olmstead, of Ontario County. There were ninety in the cattle-judging contest, won by Richard Goodwin, of Chenango County. In the poultry contest, won by Levi Collins, of Chenango County, there were fifty-one entries. The music-memory contest was especially good, with some extremely high scores. Mary Louise Couch, of Schuyler County, came through with a perfect score for the girls, while Rousseau Flower was winner for the boys. In all of the contests, second, third, and fourth prizes were awarded in addition to first prizes.

This year, for the first time, reduced railroad rates were obtained through the Trunk Line Association for practically all railroads in the State. The rate obtained was a fare and a half for the round trip, and proved very acceptable. Practically the entire delegation from Monroe County came by train. If this rate can be held for another year, many more will probably take advantage of it.

Farm bureaus

New York farmers, in fact all New York citizens, may well have considerable pride in the fact that the forerunner of the organization known as the farm bureau, which is now recognized as the largest and best educational organization of farmers in the world, had its beginning in this State. They may be equally proud of the fact that the farm bureaus have continued since the beginning without losing a single county. They should be even more proud of the fact that in New York the farm bureau has maintained that its program should be primarily educational, and has not been led astray by attractive appeals to commercialize it.

The farm bureau has always maintained that the sound principle is a partnership institution organized and supported by a local association of farmers (the farm-bureau association), the College of Agriculture, and the United States Department of Agriculture. The farm bureau continues to believe that its chief functions are (1) to furnish the means for collective action on the part of the farmers themselves in the development of local agriculture, (2) to maintain an organization for carrying on agricultural extension work within the county, and (3) to provide a local clearing-house for agricultural facts and development.

Each of the fifty-five agricultural counties in New York now has a farm bureau and a county agent. In addition, eleven counties employ full-time assistant agents, two counties employ full-time assistant agents in forestry, and seven counties employ assistant agents for six months to supervise special projects such as the spray-information service on fruits and vegetables. There is, further, a large group of trained men employed by the dairy-improvement associations who work very closely with the county agents and the farm bureaus.

The four-years period ending on June 30, 1928, has witnessed a marked increase in interest in the farm bureau on the part of the farmers and other citizens of the counties. In spite of the rapid abandonment of farms and the serious agricultural economic situation, the paid farm-bureau membership has increased from 23,398 in 1925 to 30,015 in 1928. During the same period the total appropriation from county boards of supervisors has increased from \$211,220 to \$234,495.

Not only has there been, during the past year, a satisfactory increase in membership and in local financial support, but the increasing demands on the part of farmers for more service and information indicate that additional financial support must be forthcoming, not alone from the counties but from federal and state sources as well. The Federal Government has already, through the enactment of the Capper Ketcham Law, taken the necessary steps to supply additional financial aid. In 1927 the total state contribution to the support of the county agricultural agents represented only 6.42 per cent of the total funds. This is less than the amount received from advertising in the farm-bureau publications, which comprises 6.99 per cent. The farmers contributed 19.63 per cent, the county supervisors 44.62 per cent. Additional funds were received from special contributions and other sources.

There has been a noticeable increase in the efficiency of the county farm-bureau association. The farmer committeemen, numbering nearly 6000, have, through their voluntary effort, made a large contribution to the development and promotion of the important farm-bureau projects. Through the efforts of the office of the county agent leader, the county agents, and the farm-bureau executive and community committees, the county bureaus have strengthened their programs, adopted improved methods of work, and made the organizations more businesslike.

As a few examples of the close contact which county agents have with the everyday problems of the farm, during the calendar year of 1927 they made 48,708 farm visits, received 56,733 business calls at the office, answered 59,193 inquiries over the telephone, wrote 92,912 personal letters, put up 72 exhibits at community and county fairs, and directed 168 training meetings attended by 1254 local farmer leaders. There were 1867 method and result demonstration meetings conducted, with an attendance of 53,512. In addition, 4416 other extension meetings were held, with an attendance of 236,901.

Through these contacts and by other means, 4981 farmers received help with their soils and fertilizer problems, 9387 farmers were started in planting improved seed for the first time, 3998 farmers were assisted in growing alfalfa successfully, 2405 potato growers received assistance in seed selection, treating seed for disease, and spraying, and 3647 fruit

growers received help with their cultural practices and in the control of insect and disease pests. These are cited as examples of the value of this work.

A noticeable increase in the interest of farmers in planting idle acres to trees and in woodlot management, was evident in that 2214 farms were assisted with their forestry problems in 1927 as compared with 1226 in 1925.

Livestock farmers continue to use and support the farm bureaus. Through the efforts of the county agent, 1876 farmers introduced pure-bred or high-grade livestock on their farms. Thousands of poultrymen were assisted in culling out unproductive birds. Forty-nine dairy-improvement associations were organized during the year, with 28,492 cows under test. Improved practices in the sanitary production and care of milk were adopted by 3020 farmers, and 2547 are feeding better-balanced rations. In all, 36,047 farmers adopted new practices in livestock and poultry keeping.

There were conducted 288 method demonstrations relating to rural engineering. In addition, 1044 farm buildings were constructed or remodeled in accordance with suggestions made by county agents, and 1999 farmers received assistance in engineering problems.

The field of agricultural economics and farm management is receiving much attention. There were 257 method demonstrations conducted, and 1742 farmers were assisted in keeping accounts. One county employs a full-time assistant to help farmers with this important project. There were 22 farm-management schools conducted, and 495 deserving farmers were assisted in obtaining credit. All together, 3366 individual farmers received assistance in this field. In addition, the extension service, through the county agents and specialists, counseled or advised with farmer co-operatives.

If space permitted it would be interesting to summarize the cumulative effect of the many state-wide campaigns and projects such as alfalfa, forestry, poultry, insect and disease control, and woodchuck and corn-borer control, over a period of many years. The effect on community effort, in making rural communities better places in which to live, also is of great significance but is difficult to describe in this brief report.

A new development has taken place in Seneca County which is being copied by other counties in this State and in other States. The farm bureau in Seneca County asked outstanding leaders of all the farm organizations, the bankers, and the Board of Supervisors, to cooperate in making a systematic study of the agricultural situation and to recommend long-time adjustments needed in Seneca County agriculture to meet changed conditions. This conference group called in experts from the College of Agriculture, and after much deliberation prepared a concise, businesslike report. This report was presented to all the farm organizations at their regular meetings, and to a county mass meeting of farmers and other citizens. It has since been printed in a pamphlet entitled "Look Ahead and Get Ahead," in sufficient numbers so that every farmer of the county may have a copy for his guidance.

The farm bureau and the county agents are now well established in the counties of New York. Farmers have learned to depend upon the various

services offered, as being dependable and the last word in improved agricultural practices. Changing economic conditions are constantly presenting new problems, and the bureaus and the agents are always alert to meet such problems at the proper time and in the most effective manner.

Junior extension

In general the year has been one of progress in the junior extension work, both in the number of club members enrolled and in the growth in interest in club work throughout the State. The total number of enrollments in club work on file in the state office is 18,797, as compared with 16,904 last year.

Twenty counties now employ one or more full-time county club agents, while three other counties employ club agents during the summer months. In addition there are employed in Chautauqua and Montgomery Counties, directors of agriculture with whom the College cooperates in 4-H Club work but who are employed outside the extension service and receive no financial remuneration from the extension service. Club work is being conducted in 47 counties, as compared with 46 counties in 1927. It is interesting to note that of all the girls and boys enrolling for 4-H Club work, 84.2 per cent reside in the twenty counties employing full-time county club agents.

Two new projects or demonstrations have been outlined during the year, one in pomology and one in home-yard improvement. Both of these have created considerable interest. In addition to these, the forestry and farm-shop projects have been improved and strengthened.

It is apparent that club work can best be conducted when a special county club is employed for its organization and supervision. The table on page 123 shows the enrollment in 4-H Club work by counties.

During the past year, emphasis has been placed on club organization with a leader for each organized club. The problem for the coming year will be a better and more systematic training for these club leaders, although considerable progress has been made along this line.

Contests of various kinds have been a vital part of the 4-H Club program, together with a system of awards and trips for club members showing the greatest achievement. During the past year club members have taken part in the following state and inter-state activities: New York State Fair, Syracuse; State Vegetable Growers' Association; Camp Vail, Eastern States Exposition; National Dairy Exposition; National Vegetable Growers' Association; Junior Field Days at Cornell University; and the National 4-H Club Camp at Washington, D. C. While these various contests and awards have added greatly to the interest of the club program and have served to give club work a rather wide publicity, the contest feature is being gradually submerged, particularly with regard to the competition between members, clubs, and county delegates. The present plan is to encourage club members to compete with themselves, using as a motto, "This day I will beat my own record."

A considerable part of the time of the state club leader has been given to the working-out of a revised plan for 4-H Club work. This plan has

ENROLLMENT OF 4-H CLUB MEMBERS BY COUNTIES, 1928

Twenty counties with club agents	Number of members	Twenty-seven counties without club agents	Number of members
Albany.....	613	Allegany.....	94
Chemung.....	660	Broome.....	18
Chenango.....	1,289	Cattaraugus.....	78
Cortland.....	676	Cayuga.....	266
Delaware.....	928	Chautauqua.....	740
Dutchess.....	630	Clinton.....	102
Genesee.....	600	Columbia.....	33
Jefferson.....	1,245	Erie.....	39
Monroe.....	685	Essex.....	39
Nassau.....	829	Franklin.....	133
Oneida.....	877	Fulton.....	57
Onondaga.....	1,023	Herkimer.....	57
Ontario.....	654	Lewis.....	50
Orange.....	621	Livingston.....	77
Oswego.....	1,000	Montgomery.....	153
Otsego.....	1,053	Niagara.....	8
Rensselaer.....	527	Orleans.....	27
Schuyler.....	540	Rockland.....	31
Tompkins.....	510	St. Lawrence.....	250
Wyoming.....	880	Saratoga.....	19
		Schenectady.....	162
		Schoharie.....	36
		Steuben.....	267
		Tioga.....	16
		Washington.....	43
		Wayne.....	119
		Yates.....	43
Total.....	15,840	Total.....	2,957

Grand total 18,797

been approved by a committee of the faculties of the New York State Colleges of Agriculture and Home Economics and by the county club agents. It is planned to have it ready to go into effect on October 1, 1928. As contrasted with the former program of 4-H Club work, the present plan aims to encourage a broader study of agriculture and country life, gives greater emphasis to heart, health, civic, and community-service activities, and provides a more attractive year-round program.

It remains to be seen just how this program will be received by the young people of the State. It is assumed that there may be some falling-off in enrollment during the first year and until the new plan becomes established. On the other hand, there is considerable evidence that the new program, offering as it does a very definite and completely outlined procedure, appeals to local leaders, and it is expected that a large number of new leaders will be recruited.

A bulletin giving the plan and purpose of the 4-H Club work has been prepared. This will be followed by others, and all of these will form a complete 4-H handbook for club work in New York.

Publications

The work of the Office of Publication during the fiscal year ending June 30, 1928, has been somewhat hampered by lack of funds. At the end of the year a number of manuscripts which were edited and ready for the printer had to be held in the office because the appropriation was not large enough to take care of them.

The newspaper clipping service, which tells the members of the College which of its news items are being used by the papers of the State, had to be canceled during the final four months of the year, and this seriously affected the efficiency of the service because the departments which originated the news items were not able to see the results of their work. Certain changes and consolidations in personnel further hampered the work somewhat and have given some members of the staff a considerable amount of extra work. The lack of funds also has made it impossible to keep some of the best helpers in competition with the demands made for them by other organizations.

Changes during the year. At the end of the year L. P. Ham, who had been one of the most efficient workers in the office, in executive charge of the news service and of the duties in connection with the distribution of publications, resigned to become affiliated with the *American Agriculturist*. His duties have been taken over in a large measure by G. S. Butts, who still continues in charge of visual instruction and also is in charge of the correspondence courses.

Instruction of students. The courses given in the Department of Extension Teaching which deal with agricultural journalism are attracting more students each year, particularly among the graduate students who expect to go into extension work in this and in other countries. During the past year, for example, a course in advanced agricultural information had on its rolls the Superintendent of Vocational Education of Arkansas, a man who had a similar position in North Dakota, a man who is to start an agricultural paper for the Irish Free State, a county agricultural agent from Ohio who, as a result of the course, is to take a position as agricultural editor at the University of Minnesota, a student from Tanganyika Province, which was formerly German East Africa, a student from South Africa, a man who is one of the leaders in the Agricultural Extension Service of New York State, and a man who is in charge of an agricultural mission at Tranvacore in southwestern India. These are only a part of the class of 32 students, mostly seniors and graduates, who took that particular course. The total enrollment in the department was 77 students.

Bulletins issued. There was a considerable increase in the work of the Editorial Office, as is shown by the following figures. The total number of bulletins in 1927 was 71, as against 90 in 1928. The number of printed pages in 1927 was 3570, as compared with 3653 in 1928. The total number of bulletins printed in 1927 was 997,600 and in 1928 was 1,065,300. The increase was particularly marked in the extension publications. In 1927 there were sixteen publications, exclusive of reprints, with 313 printed pages and 120,000 copies. In 1928 there were twenty publications, with 789 printed pages and 133,500 copies. The measure of

editorial work done is represented by the actual number of pages edited, which was two and one-half times as many in 1928 as in the preceding year.

The following tabulation gives the list in detail:

	Number of pages in printed publication	Number of copies printed
MEMOIRS:		
109 Studies of the life history of <i>Ustilago avenae</i> (Pers.) Jensen and of <i>Ustilago levis</i> (Kell. & Swing.) Magn. (Plant Pathology)	35	5,000
110 The effect of freezing on the respiration of the apple (Pomology)	28	4,000
111 A population study of three townships in Cortland County, New York (Rural Social Organization)	19	4,000
112 A survey of sickness in rural areas in Cortland County, New York (Rural Social Organization)	27	4,000
113 Studies of protein metabolism, mineral metabolism, and digestibility, with clover and timothy rations (Animal Husbandry)	33	4,500
114 Building up resistance to diseases in beans (Botany)	15	4,000
115 Some relations of green manures to the nitrogen of a soil (Agronomy)	29	5,000
116 Rural population of New York, 1855 to 1925 (Rural Social Organization)	121	3,500
117 Chromosome numbers in <i>Zea Mays</i> L. (Botany)	44	4,000
Total	351	38,000
EXPERIMENT-STATION BULLETINS:		
459 The demand side of the New York milk market (Agri- cultural Economics and Farm Management)	86	10,000
460 Bacteria count limits and the transportation of milk (Dairy Industry)	37	10,000
461 Farmers' cooperative business organizations in New York (Agricultural Economics and Farm Management)	123	8,000
462 Economic studies of dairy farming in New York. VIII. Grade B milk with cash crops and mixed hay roughage, crop year 1924 (Agricultural Economics and Farm Management)	38	6,000
463 Relative adaptability of red-clover seed of different origins (Plant Breeding)	38	7,000
464 An economic study of certain phases of fruit marketing in western New York (Agricultural Economics and Farm Management)	51	8,000
465 Twenty years growth of a sprout hardwood forest in New York: a study of the effects of intermediate and re- production cuttings (Forestry)	49	7,500
466 Interrelationships of supply and price (Agricultural Economics and Farm Management)	144	7,500
467 Tomato fertilizer studies in Chautauqua County, New York (Vegetable Gardening)	24	6,000
468 Whey butter (Dairy Industry)	12	4,500
469 The collection of general-property taxes on farm prop- erty in the United States, with emphasis on New York (Agricultural Economics and Farm Management)	51	5,000
Total	653	79,500

		Number of lines pages in printed and publication price	
READING-COURSE LESSONS FOR THE FARM:			
152	(Reprint) China asters (Floriculture and Ornamental Horticulture)	33	4.00
160	(Reprint) Harness repairing (Rural Engineering).....	79	5.00
Total		112	9.00
READING-COURSE LESSONS FOR THE HOME:			
85	(Reprint) The arrangement of household furnishings (Home Economics)	12	5.00
134	(Revised reprint) Household insects and their control (Entomology)	40	5.00
Total		52	10.00
EXTENSION BULLETINS:			
10	(Reprint) Gladiolus studies—II. Culture and hybridization of the gladiolus (Floriculture and Ornamental Horticulture)	84	5.00
45	(Revised reprint) Cornell poultry rations (Poultry Husbandry)	11	5.00
47	(Revised reprint) List of publications for general distribution (Extension Service).....	12	5.00
57	(Reprint) Soldering (Rural Engineering).....	27	5.00
59	(Reprint) Directions for collecting and preserving insects (Entomology)	12	5.00
67	(Reprint) The flower garden (Floriculture and Ornamental Horticulture)	42	5.00
87	(Reprint) Grading, packing, and handling head lettuce in New York State (Vegetable Gardening).....	10	1.00
89	(Reprint) The home orchard and fruit garden (Pomology)	52	5.00
94	(Reprint) Fitting the farm saw (Rural Engineering)....	36	5.00
108	(Reprint) The farm shop and tool equipment (Rural Engineering)	27	5.00
111	(Reprint) Dairy-barn rearrangement (Agricultural Economics and Farm Management).....	9	8.00
115	(Revised reprint) Chicken lice and mites and their control (Entomology)	17	5.00
119	(Reprint) Health and personal appearance (Home Economics)	23	5.00
122	(Reprint) Better seed for commercial vegetable growers (Vegetable Gardening)	22	5.00
135	(Reprint) Potato diseases and their control (Plant Pathology)	123	5.00
143	(Reprint) Capon production (Poultry Husbandry).....	16	5.00
144	(Reprint) Artistry in dress (Home Economics).....	67	5.00
146	(Reprint) Fitting and using the dress form (Home Economics)	50	5.00
149	(Reprint) Feet and shoes (Home Economics).....	12	10.00
150	(Reprint) Children's clothing (Home Economics).....	17	5.00
151	(Reprint) Dairy-stable ventilation (Rural Engineering)..	35	5.00
153	(Reprint) Rearing chickens (Poultry Husbandry).....	29	10.00
155	(Reprint) Grinding farm tools (Rural Engineering).....	34	5.00
157	Diseases of small grains (Plant Pathology).....	71	5.00
158	Drafting and adapting the one-piece pattern (Home Economics)	40	10.00
159	Preservation of foods (Home Economics).....	106	10.00
160	Silage crops in New York (Agronomy).....	20	5.00

	Number of pages in printed publication	Number of copies printed
161 Soil and field-crop management for Wayne County, New York (Agronomy)	75	5,500
162 The control of aphids on house plants (Entomology).....	16	5,000
163 Selection and use of the dairy bull (Animal Husbandry).	31	5,000
164 Feeding and care of the dairy bull (Animal Husbandry).	15	5,000
165 Horse breeding (Animal Husbandry).....	34	10,000
166 How to judge horses (Animal Husbandry).....	55	5,000
167 The production of maple sirup and sugar in New York State (Forestry)	76	5,000
168 Wild mustard and related weeds (Botany).....	19	5,000
169 The farm horse situation in New York State (Agricultural Economics and Farm Management).....	27	5,000
170 Bacterial canker of tomatoes (Plant Pathology).....	4	5,000
171 Combating diseases of vegetables (Plant Pathology).....	28	8,000
Total	<u>1,384</u>	<u>265,500</u>

UNIOR EXTENSION BULLETINS:

5 (Reprint, supplement only) Pig club project record (Animal Husbandry)	4	1,000
6 (Reprint) Potato growing for boys and girls (Vegetable Gardening)	61	5,000
11 (Reprint) Vegetable gardening for boys and girls (Vegetable Gardening)	39	5,000
12 (Reprint, supplement only) Poultry club project record (Poultry Husbandry)	4	5,000
17 (Reprint) 4-H club member's record book—first-year homemaking (Home Economics).....	13	10,000
18 (Reprint) 4-H club member's record book—foods and nutrition, elementary (Home Economics).....	12	7,500
19 (Reprint) 4-H club member's record book—foods and nutrition, advanced (Home Economics).....	9	7,500
24 A garden primer (Vegetable Gardening).....	17	8,000
25 School lunch and breakfast for the 4-H club girl—a manual for 4-H club members in first-year homemaking and in foods and nutrition, elementary (Home Economics)	20	12,000
26 Fifty common trees of New York (Forestry).....	61	5,000
27 Home planting for boys and girls (Vegetable Gardening, Pomology, and Floriculture and Ornamental Horticulture)	44	10,000
28 Hand-planting forests; forestry for 4-H club boys and girls—first year, tree planting (Forestry).....	30	5,000
Total	<u>314</u>	<u>81,000</u>

RURAL SCHOOL LEAFLETS:

September, 1927 (Rural Education).....	144	30,000
November, 1927 (Rural Education).....	48	150,000
January, 1928 (Rural Education).....	48	150,000
March, 1928 (Rural Education).....	36	150,000
Total	<u>276</u>	<u>480,000</u>

MISCELLANEOUS:

(Reprint) How to keep a cash account on a farm (Agricultural Economics and Farm Management).....	36	10,000
(Reprint) How to take a farm inventory and make a credit statement (Agricultural Economics and Farm Management).	22	25,000

	Number of pages in printed publication	Number of copies sent
(Reprint) How to keep an account with dairy cows (Agricultural Economics and Farm Management).....	20	5.50
(Reprint) How to keep a poultry account (Agricultural Economics and Farm Management).....	20	5.00
Clothing records (Home Economics).....	27	4.00
Program of the twenty-first annual Farm and Home Week, 1928	32	12.00
Plowing to control the European corn borer (Entomology)....	4	10.00
Total	161	71.00
ANNUAL REPORT for 1927, College of Agriculture.....	156	3.00
ANNUAL REPORT for 1927, College of Home Economics.....	42	3.00
Total	198	7.00
ANNOUNCEMENTS:		
Announcement of the New York State College of Agriculture, 1927-28	76	12.00
Announcement of the New York State College of Home Economics, 1928-29	41	6.00
Announcement of winter courses, 1928-29.....	35	6.00
Total	152	24.00

SUMMARY

	Total number*	Total pages	Cost
Memoirs	9	351	38.00
Experiment-station bulletins	11	653	79.50
Reading-course lessons for the farm.....	2	112	9.00
Reading-course lessons for the home.....	2	52	10.00
Extension bulletins	38	1,384	265.00
Junior extension bulletins.....	12	314	81.00
Rural school leaflets.....	4	276	48.00
Miscellaneous	7	161	71.00
Annual reports	2	198	7.50
Announcements	3	152	24.00
Total	90	3,653	1,065.00

*Including reprints.

Agricultural Economics and Farm Management

During the past few years there has been a great demand from farmers for extension work in marketing. Because sound extension teaching must be based on sound research, it was at first necessary to delay the extension program in marketing until sufficient research was completed. Due to the rapid development of this research in the department, there has been, for the past two years, a decided need for at least one full-time marketing extension specialist. A limited amount of extension teaching in this subject has been done by members of the department's extension staff, but most of it has been done by members of the regular teaching and research staffs. Although members of the teaching staff are well

qualified for extension work, and are very willing to give as much assistance as possible, it has been physically impossible to meet the increased demand for extension work in marketing and to make full use of the available results of research. By cutting down on funds for farm-management extension on next year's budget, it has been possible to arrange for employment of one full-time marketing extension specialist. However, with the steadily increasing demand from farmers for information and assistance on their marketing problems, it is probable that there will soon be need for two such specialists on full time.

There is also a decided need for an additional full-time farm-management extension specialist who has completed his graduate work. The farm-management extension teaching is now done by a professor and an assistant professor, both on full time, with the help of several part-time instructors. A much better way would be to have all extension work done by full-time men who have finished their graduate work.

Farm-management and marketing schools. During the past few years there has been a decided decrease in the call for three- and four-day farm-management extension schools, and a corresponding increase in the demand for one- and two-day schools and for single all-day meetings. This change, probably due to the fact that the shortage of farm labor prevents full attendance by farmers at the longer schools, has led to the encouragement of one-day schools where, if possible, they can be preceded by a community labor-income survey. During the past year the department has conducted, alone or in cooperation with other departments, six marketing and five farm-management extension schools. Of the farm-management schools, one was preceded by a community labor-income survey, the labor-income records thus obtained being used as a basis for lectures and discussions at the schools, and, as such, being of inestimable value. The average attendance per session at the extension schools was 69, as compared with 18 for last year.

Institutes. There were 22 institutes held during the year, at which farm-management specialists gave lectures or discussions. There is a decided place in the farm-management and marketing extension field for the old-time farmer's institute. In many communities the annual "institute" is an established institution, and economic material can usually be better presented at such meetings than at special farm-management or marketing schools called for that purpose only. Many so-called institutes are in reality one-day extension schools, at which no registration fee is charged and at which a local person presides as chairman in place of the county agricultural agent.

Community meetings. During the past year 100 lectures were given at community meetings, at which the average attendance was 34.6. Most of these lectures were scheduled in a series of communities by county agricultural agents as a part of their regular community programs.

Several times during the year, lists of lectures and discussions which members of the department are prepared to give are sent out to the county farm bureaus. The subjects included in these lists for which there has been the greatest demand from farmers during the year are, in order of the importance of demand, as follows: adjusting farming to present economic conditions; how to take a farm inventory and make a credit state-

ment; factors affecting the demand and supply of milk in the N milk shed; some principles of successful cooperation.

Miscellaneous lectures. In addition to the lectures ref above, members of the department gave 77 lectures to rotary and clubs, chambers of commerce, annual farm bureau meetings, ann ings of farm loan associations, granges, and other groups inte agriculture. Organizations such as rotary clubs and chambers merce frequently invite a group of farmers to one of their dinner ings, and ask for a speaker from this department to discuss the present agricultural situation, farm credit, the farm tax situation, or other agricultural-economics or farm-management subjects. More extension work of this kind should be done, as it helps to acquaint city business men with farm problems and to bring about better business relations between city and country.

Emergency dairy-situation meetings. In the fall and winter of 1926, the supply of milk for New York City approved by the New York Board of Health was barely enough to meet the city's demands. Fearing a shortage in 1927, the dairy interests of the State worked to stimulate fall and winter production in the New York City milk shed. In cooperation with the local farm bureaus and the Department of Animal Husbandry at this College, members of the extension staff of this department arranged a "dairy situation" campaign and 56 milk-marketing meetings were held at which factors affecting milk supply and demand were discussed and the economics of the dairy situation were explained. Although these meetings were held during the summer months, when farmers were very busy, the average attendance was 50. This series of meetings showed very clearly the value of having research precede any extension teaching in marketing. The work done by our research staff in milk marketing was of inestimable value when the extension staff was called upon to conduct this series of meetings.

Feed-dealers' schools. Frequently at extension schools, in past years, after a farm-management man had advised farmers to pay cash and get the discount, and an agronomy or a plant-breeding man had told them to buy a certain kind of seed, the farmers would say that they could not get the desired service from local dealers. During the past year a decided improvement has been made in the situation by holding special extension schools for feed dealers. The department has cooperated with other departments of the College in holding one feed-dealers' school, and has also held five meetings with groups of feed dealers. At these meetings, discussions were conducted on the cost of feed-store credit and factors affecting the cost of operation of feed stores. These meetings, which were attended by 179 different dealers, have succeeded in bringing about much closer relations between feed dealers and the extension service.

Correspondence courses. The following correspondence courses have been offered during the year: one elementary and two advanced courses in general farm management; one course in farm accounting; one course in cooperative marketing; one course in agricultural prices; and a special course in prices for agricultural teachers and county agents. The present enrollment in all courses is 93. The enrollment during the year has averaged 92, and 47 certificates have been awarded.

ferences. Members of the department have held, during the year, conferences with officers and directors of cooperative associations, with officials of state schools of agriculture, representatives of state and county agricultural associations, groups of high-school agricultural teachers, managers of institutional farms, and other agricultural groups. The conferences with representatives of cooperative associations were usually for the purpose of giving assistance in planning sound financial policies or of establishing or checking systems of accounting. Conferences with officials of state schools of agriculture were usually for the purpose of making analyses of state farms or to give assistance in setting up or closing accounts. The conferences with high-school teachers were to discuss recent farm-management and marketing work and to help in planning courses of instruction for high-school students. At conferences with groups of bankers and groups of both farmers and bankers, problems of mutual interest to bankers and farmers were discussed; and as a result of a series of conferences with representatives of the State Bankers Association, a farm-credit statement was drafted which is now the official statement of the New York State Bankers Association, the College of Agriculture, and the Federal Reserve Bank of New York.

The "Market Basket." The "Market Basket," which consists of a monthly mimeographed summary of crop and market information and available economic material, has been furnished to all county agents for publication in their county Farm Bureau News. The "Market Basket" offers an excellent way in which to bring to the attention of farmers results of recent research studies sometime in advance of publication in bulletin form.

Farm business service. The farm business service consists of the following procedure. The farmer pays a fee of \$2, takes his own inventory, and keeps a record of his cash receipts and expenses. At the end of the year the College summarizes the records, and, after making an efficiency study of the farmer's business, makes such recommended changes as the study seems to indicate are desirable. At the present time the service is limited to four farmers per county.

Farm-management tours. During the summer of 1927, there were fourteen farm-management tours held in as many counties. The average attendance was 63 persons per tour. On several of these tours, the farms visited had been included in farm-management-community surveys during the preceding winter, and on two of them the agronomy specialist who had cooperated on the community survey was present and gave excellent assistance.

Genesee County farm-account service. The Genesee County farm-account service, which was started on March 1, 1927, has been carried on throughout the year and complete sets of farm accounts were closed on 50 farms. A full-time farm-management specialist was employed jointly by the farmers receiving the service, the central Farm Bureau Office, the Genesee County Farm Bureau, and this department. This specialist kept complete cost accounts on the farms, visiting each farm at least once a month to post the accounts and give advice. Each farmer cooperator has paid \$18 a year for the service, and the balance of the budget of \$3200 was covered by the other cooperating agencies. Sufficient funds are now

available for paying the salary of a specialist on the service only up to July 1, 1928, but the members of the service have voted to continue the work on the present basis in the hope that funds can be found for carrying the project for the balance of the year.

There is definite place for a special farm-management agent in a number of other counties in the State. This man should be appointed as an assistant county agent for the purpose of helping farmers with their records and of acting as a farm-management adviser. The work necessarily requires a man of great ability and the expenditure of a budget of from \$3000 to \$4000.

Cooperative cost accounts. The cooperative extension and research work in cost accounting has been conducted on the same basis as in former years, with the exception that more attention has been paid to the interpretation of results and the making of recommendations to farmers. Accounts were closed on thirty-five farms. The material furnished by these accounts is of great value as a basis for extension teaching, and the cost-account cooperators have always served as key men for other farm-management extension work.

Farm Economics. Members of the resident research and teaching staffs of the department have carried on a valuable piece of extension work in the publishing of *Farm Economics*. This publication, giving a monthly review of agricultural prices and conditions and results of recent research work in the field of agriculturaleconomics, is now being sent to 3726 farm-bureau committeemen, agricultural teachers, county bankers, and other leaders in agricultural work. The material is widely quoted by farm papers and the metropolitan press.

Farm-account work with juniors. Through the cooperation of the agricultural committee of the New York State Bankers Association and the office of the State Club Leader, a 4-H farm-account project has been conducted in five counties of the State. The purpose of the project is to encourage the keeping of simple farm records and accounts, to teach better farm-business methods, to use the accounts as a basis for making more money on the farm concerned, and to teach members how to use a bank. Each club is sponsored by a local bank, and an officer of the bank serves as local leader. A progressive farmer serves as assistant leader. An extension specialist from the department visits each club six times a year and assists in starting, keeping, and summarizing the accounts.

Farm-inventory-and-credit-statement campaign. The success of the 1926 farm-inventory campaign, which was started rather late in the season and on a rather limited scale, led to the planning of a much larger campaign for 1927-28. During the past year an excellent step was taken by the banks in the State, which made it especially desirable to concentrate extension forces on a state-wide farm-inventory campaign. For several years a farmer's credit statement has been included in our farm-inventory book. While this statement was looked upon very favorably by bankers in the State, it was not an official credit statement of any banking institution or bankers' organization. The Federal Reserve Bank of New York had also prepared a farmer's credit statement, but this had not come into general use by country banks. At the request of the Agricultural Committee of the New York State Bankers Association, representatives of this

department met with that committee and the group agreed upon a special form of farmer's credit statement which is now the official credit statement approved by both the College and the State Bankers Association. This credit statement was later approved by the Federal Reserve Bank of New York, and is now furnished by that institution to all member banks and included in our new farm-inventory books.

In addition to the expected cooperation that came from the county agents and the country banks, several organizations which had never before cooperated on the inventory work gave most valuable assistance. These included the State Department of Education, the New York State Farm Bureau Federation, the *Cornell Countryman*, many of the local granges in the State, the Dairymen's League, Borden's Farm Products Company, Sheffield Farms Company, the Eastern Federation of Feed Merchants, the Grange League Federation, the Michigan Limestone Company, the Portland Cement Association, the *American Agriculturist*, and the *Dairymen's League News*. The publicity given to the campaign resulted in a tremendous demand for the college farm-inventory book. A revised edition of 10,000 copies was exhausted in the first ten days of the campaign. An additional 5000 went a little faster, and a second 10,000 were more than half gone before the beginning of Farm Inventory Week. By the end of that week, 20,490 farm-inventory-and-credit-statement books had been distributed. The results of the campaign indicated that the number of farmers who took inventories this year was more than double that of any previous year, and proved conclusively three things: (1) the need for another campaign; (2) the need for starting earlier in planning future campaigns; and (3) that the farm-inventory-and-credit-statement project is the most valuable kind of farm-account work that has been done.

Cash and single-enterprise accounts. In the farm-account work the greatest emphasis was placed on the farm inventory. However, account books for cash, crop, dairy, and poultry accounts were also furnished to farmers on request. During the year the following numbers of these account books were requested: *How to Keep a Cash Account on a Farm*, 4210; *How to Keep an Account with a Crop*, 7680; *How to Keep an Account with Dairy Cows*, 1650; *How to Keep a Poultry Account*, 3525.

Agronomy

The extension work in soils and crops has been conducted during the year in accordance with the general program which has been in operation for the past five years. It consists of the following twelve subprojects: lime; fertilizers; farm manure; organic matter and green manure; soil tillage and cultivation; soil improvement through crop rotation; pasture management; silage-crop production; alfalfa production; forage- and hay-crop production; small-grain production; weed eradication.

Subproject 9, alfalfa production, has received special emphasis during the year as a result of the alfalfa and alfalfa-clover campaigns which have assisted also in developing many of the other subprojects in the organized counties. As a result of the intensive alfalfa-clover work in certain counties, it has been necessary to retrench somewhat in the work done in other counties. Care has been exercised, however, not to materially weaken the

program in the State as a whole. The campaigns have now been consummated in ten counties. Four counties are in the midst of campaigns, with others being added as rapidly as possible. Requests are on file from seventeen counties in addition to the four which are now organized. The following six main lines of procedure have been employed in carrying the program to the farmers of the State: (1) meetings, including particularly community meetings, extension schools, farmers' institutes, meetings of local agricultural groups, and granges; also, meetings of various farm-bureau committees for the purpose of discussing the whole agronomy program in a county or a particular part of it; (2) summer meetings, including particularly meetings at field demonstrations and tours; (3) field demonstrations in as many cases as possible, especially when they could be located along main highways and properly placarded; (4) publicity through extension bulletins and leaflets, through articles for the agricultural press, and through the farm bureau and the college news service; (5) farm visits and fair exhibits; (6) personal letters.

The extension agronomists have given personal service to fully one thousand alfalfa and clover producers in organized campaign counties. The majority of these cooperators have seeded one or the other of the two legumes in accordance with the specifications furnished. A conservative estimate of the acreage seeded in accordance with these specifications would be from 10,000 to 12,000. Increased interest in alfalfa and clover is evident in practically all counties of the State.

Other miscellaneous activities of the year include: schools for feed, seed, and fertilizer dealers held in cooperation with the Departments of Animal Husbandry, Plant Breeding, and Agricultural Economics and Farm Management; a fertilizer school for fertilizer salesmen of the State; a lime school for lime dealers of the State; development of fertilizer formulas for the Cooperative Grange League Federation Exchange; development of fertilizer ratios for fertilizer manufacturers; preparing and teaching a correspondence study course in soil management.

It is planned that the same general methods will be followed over a three- to five-years period. Briefly, they include the following activities:

1. In the community:
 - a. Field demonstrations in as many localities as practicable where such demonstrations are desirable.
 - b. Presentation of the subject-matter of the various subprojects at community meetings, farmers' institutes, and extension schools.
 - c. Field meetings in connection with demonstrations concerning lime, fertilizers, temporary and rotation pasture crops, permanent pasture management and improvement, alfalfa, small grains, forage crops especially the catch hay crops, and cover crops.
2. In the county:
 - a. Furnishing special information to county agents relative to details of the subject-matter program.
 - b. Special service in examination of samples of soils, fertilizers, lime, and similar miscellaneous materials.
 - c. Personal assistance to county agents in establishing field demonstrations in counties.
3. In the State:
 - a. Planning and general supervision of the soil and crop extension work in the State as a whole, with a view to developing a state-wide program with necessary deviations to meet the needs of particular sections, counties, or communities.

- b. Continuation of the alfalfa-clover service work.
 - c. Correlation and interpretation of experimental results and the results from the state-wide demonstrations.
 - d. Special service to farmers of the State through personal correspondence.
 - e. Presentation of subject matter at meetings of state agricultural organizations, during Farm and Home Week and on other occasions.
 - f. Examination of soil samples, fertilizers, lime, and other materials submitted by farmers of the State.
 - g. Furnishing expert information on lime, fertilizers, seeds, and other items of general agronomic interest, to commercial organizations and farmers' co-operative societies.
 - h. Conducting correspondence courses in soil management.
4. Plans for propaganda and publicity:
- a. Preparation monthly for the county farm bureau news service of articles dealing with the subject matter being emphasized in the program.
 - b. Preparation monthly of "Soil and Crop Notes" for the county farm bureau news service.
 - c. Preparation and distribution of leaflets dealing briefly with the more important phases of the program.
 - d. Preparation and distribution of extension bulletins dealing in more detail with the subject matter being emphasized.
 - e. Preparation by specialists of subject matter to be presented at community meetings, farmers' institutes, and extension schools.

The effectiveness of the extension work in agronomy during the twelve-months period is indicated by the increased demand for definite specifications relative to the various field operations having to do with soil management and field-crop production. More lime has been applied in accordance with the results of soil tests than ever before. While there is no conclusive evidence of an increase in total tonnage used, it is evident that the lime has been used more efficiently. The one-day school held for the limestone dealers of the State was of value in furthering a uniform liming practice for New York soils.

Continued progress has been made in improving the fertilizer practices in the State. During the past five years the great majority of farmers using mixed fertilizers have changed from low-analysis to high-analysis mixtures. Superphosphate (acid phosphate) is being used more extensively on dairy farms each year. Five special fertilizer formulas for high- and low-lime muck have been developed during the year. These have been accepted as improved formulas and are being used by several hundred vegetable growers. The fertilizer-salesmen schools held in various sections during the winter and spring, as well as the one-day state-wide school at Ithaca, will result in a better understanding by dealers of the farmer's fertilizer problems. Result demonstrations with concentrated fertilizers have been established in Monroe and Suffolk Counties.

While economic conditions have not been favorable for extensive pasture improvement, farmers have shown a keen interest in their pasture-management problems and a willingness to incorporate methods of improvement. Definite progress has been made in increasing the acreage of sweet-clover pastures. A pasture-management exhibit was presented at the State Fair.

Animal Husbandry

The regular extension work of the Department of Animal Husbandry has been done by six specialists. Resident instructors in the department

assume special appointments sometimes, and an extra speaker is employed during three months to handle farmers' institutes. There are two specialists on dairy production, one on dairy-improvement associations, one on sheep and wool production, one on livestock sanitation, and one on junior club work.

There is no change in the general livestock extension program which has been followed for several years. The work on dairy-improvement associations and livestock sanitation is gaining momentum. The club work for juniors is increasing in amount, but is developing along the usual lines with the exception of two regions (Dutchess County and Genesee County) where baby-beef clubs have become successful.

Emphasis has been given during the past year to the following lines of work: better breeding stock (sire surveys, introduction of females, safety-bull-pen contest); problems in reducing the feed cost of production (use of legumes, selection and use of concentrates, feeding practice, stable routine); dairy-improvement associations (supervision of testers, schools for testers, conferences with testers, summarizing records and returning the results to owners); wool and meat production (steer-feeding and lamb-feeding demonstrations comparing grain, roughage, and housing); livestock health and replacements (rearing healthy calves, abortion control, udder troubles, control of "stiffness in lambs"); junior livestock club work (calf clubs, lamb clubs, pig clubs, tours, demonstration contests, exhibition of animals).

As the major projects remain much the same, there are no great variations from year to year in the activities of the specialists. The total number of teaching contacts in 1927-28 was considerably larger than in 1926-27, being 98,354 this year as compared with 74,985 last year. The total number of meetings was slightly less than last year, but the average attendance was greater. There were 61 articles prepared for the press, 39 circular letters written, with a circulation of 8514, and 8269 other letters written.

A few figures gleaned from county-agent reports showing some of the results of extension teaching in animal husbandry during the year, are worth recording: Some 394 method demonstrations and 246 result demonstrations, involving 6375 animals, showed a profit or a saving amounting to \$31,380. In addition to the already large list of converts, 367 farmers culled their herds and flocks this year for the first time, discarding 1154 animals out of a total of 7040. Also, 2994 dairymen were persuaded to use better-balanced rations. There are now some 8615 farmers on the mailing list who receive the monthly personal feed-service letter. Within the fifty-one active dairy-improvement associations, there are now 23,633 cows under test as compared with 18,165 a year ago.

County-fair exhibits. There has been a growing demand in recent years, by county agricultural agents, for simple, compact exhibits covering special features in animal production. During the past season an effort was made to meet this demand, or at least to determine the sort of exhibit most practicable for the purpose. Accordingly the four following exhibits, the nature of which is indicated by title, were sent out to county fairs:

1. Milk essential in the rations of all young animals. (Illustrated with rats.)

2. Legumes in the ration save the feeders money.

3. Legume hays make better heifers at less cost. (Illustrated by photographs and comparative data.)

4. Advantages of dairy-herd-improvement work.

Eighteen fairs made use of these exhibits and reported favorably as to interest shown in them.

Summary of horse-pulling contests, 1927. The horse-pulling contests have attracted widespread interest, serving to center attention on proper driving, harnessing, and training. Eight of these contests were held, with results which may be summarized as follows:

Fair	Number of entries, light class	Pull (pounds)	Number of entries, heavy class	Pull (pounds)	Attendance
Monroe County	3	2,000	.....	.....	500
Genesee County	5	2,500	2	2,500	2,000
Lewis County	5	2,400	4	2,700	{ 10,000
					{ 8,000
State Fair	10	2,600	9	2,700	{ 8,000
					{ 10,000
Erie County	3	2,600	5	3,000	{ 1,000
					{ 4,000
Herkimer County	2	2,100	.....	.....	600
Broome County	4	2,300	2	2,300	300
Cattaraugus County	2	2,400	4	3,050	{ 10,000
					{ 7,000
Total	34	.....	26	.....	61,400

This year the contests were usually held in front of the grand-stands, thereby increasing materially the total number of spectators. Estimates of attendance were based upon the opinion of fair officials. More than 3500 copies of a pamphlet entitled *Pulling Power of Horses and Mules*, published by the College, were distributed to the spectators during the contests.

That there has been an increasing amount of interest in these contests is indicated by the increase in the number of spectators and by the large number of inquiries for the use of the dynamometer.

Disease-control work. It may safely be said that some headway is being made in the control of abortion, udder troubles, and other disturbances injurious to farm stock. The extension veterinarian has answered more calls for meetings during the past year than heretofore. The most successful type of such meetings is designated as "Selecting cows for soundness." The animals are examined at barn meetings for defects, and comments are made. Such an occasion brings out questions which finally lead to a revelation of the troubles that the visitors are having at home. Besides carefully going over the animals at hand, the veterinarian usually is urged to visit other farms for counsel.

The demand for blood testing in dairy herds presents a serious problem. Veterinarians are being urged to prepare to meet it, and herd owners are being instructed as far as is possible in a better understanding of the disease. Its economic importance is so great that a definite program of education through the farm bureaus was planned at the annual conference in 1928. This plan embraces two things: a series of brief mimeographed leaflets issued monthly so as to cover in a progressive way the known methods of recognition and control of the disease; and the cooperation of a

limited number of herd owners in keeping herd health records. Such records, when summarized at the end of the year, will afford a basis for guidance of the immediate owner as well as demonstration material for other interested owners in the community.

In regions free from tuberculosis, there are many heifers being reared to sell as replacements. This implies a large responsibility from the time when the calf is born until it becomes a producer. Discriminating buyers want sound cows as well as high producers. The extension veterinarian recognizes this as a major part of his work, and is guided accordingly.

Dairy-improvement associations. During the year the number of dairy-improvement associations has increased from 42 on July 1, 1927, to 51 on June 30, 1928. This includes one junior association operated by 4-H Club boys. These 51 associations, representing an increase in the year of 21 per cent, include 1138 herds and 23,633 cows. The associations are located in 33 counties, Madison County leading with 5 associations and Otsego County being a close second with 4. Only 3 associations have been discontinued during the year, and 12 new ones have been organized.

In addition to the regular associations, dairy-improvement clubs are active in Ulster, Oswego, and Cayuga Counties.

The problem of obtaining an adequate supply of well-qualified testers has been partly met through two training schools. A school of one week was held during September 19 to 24, 1927, brought out an attendance of 21. Of these 21 students, 12 qualified for positions and 9 have started testing. The other school, lasting two weeks, was held during January 16 to 28, 1928. Of the 20 students attending this school, 14 qualified and 11 of these have obtained positions in associations. The training needed for association work requires at least two weeks, in addition to the ability to operate the Babcock test.

A special effort was made to interest students in the secondary schools of agriculture by giving three days instruction at each of the six schools. Four association testers were obtained from these schools.

While the distribution of supplies is mostly for associations, materials are supplied also to dairymen who are not members of associations. The distribution during the past three years has been as follows:

	Year ending June 30, 1926	Year ending June 30, 1927	Year ending June 30, 1928
Milk-weight sheets	5,395	5,841	6,266
Herd-record books	1,354	1,658	1,754
Barn-record books	178	252	241

During the year, 300 herd-record books were summarized and returned to the owners. Each member of a dairy-improvement association with a herd of five or more cows averaging 300 pounds or more of milk in one year, receives from the National Dairy Association a national Honor Roll Diploma. For the year ending on June 30, 1925, 16 New York dairymen, members of dairy-improvement associations, received these diplomas; for the year ending on June 30, 1926, 37 dairymen received diplomas; and for the year ending on June 30, 1927, 105 dairymen received diplomas, some of them receiving the honor for the third time.

Junior livestock work. The livestock club work has made striking progress during the past three years, due to a receptive public attitude, improved organization, and efficient leadership. The work has been developing rapidly, and may now be examined in terms of its own interests and activities. It should be kept in mind that junior extension is as much a training for life as for vocation. To some it opens up a new world, and the momentum derived from club work sends many a boy or girl far along the road to an attractive goal. Tabulations showing activities have interest and are valuable, but there is no way to measure the widened horizon of a member fired with the determination to succeed.

The following summary shows the activities of the past year:

	Dairy cattle	Beef cattle	Swine	Sheep	Total
Number of clubs.....	62	1	12	5	80
Membership in clubs:					
Boys	814	9	201	200	1,224
Girls	104	....	15	29	148
Number of animals involved.....	949	10	547	622	2,128

Bull associations and bull tours. In dairy communities the joint ownership of bulls has much to commend it. This idea is gaining ground in New York, and in the areas now well cleaned up as regards bovine tuberculosis it is safe to encourage such investments in bulls.

A tour is to be held in July, when interested herd owners and county agents will visit successful bull associations that have been operating for a number of years in the northern tier of counties of Pennsylvania. This has been arranged through cooperation with the cooperative-bull-association specialist of Pennsylvania. As a result similar associations may be formed in this State.

Advanced registry records. One feature of extension activities that has been immediately under the direction of the head of the department has not been included in the general extension activities, and that is the supervision of advanced registry records. While this work is not carried on so extensively as it was ten or twelve years ago, it is still considerable in amount and forms one of the most important phases of extension work. During the past year, test supervisors employed by the College have regularly visited the herds of between 125 and 130 breeders whose cows have been entered on "semi-official yearly work." These include about 900 cows, and the continuous services of about fifteen supervisors were required. The expense of the work, except for such supervision as is given by the College, is entirely borne by the persons receiving its benefits.

Botany

The extension activities of the Department of Botany have consisted this year, as heretofore, in the distribution of cultures, and in giving information relating to the inoculation of the soil in preparation for leguminous crops, answering letters regarding weeds and other plants, and giving advice in the field concerning weeds. During the past year the number of cultures distributed has been about the same as during the past several years (approximately 20,000), and the number of letters

concerning inoculation has been about 600. Some 400 or 500 letters concerning weeds and plants have been written. A member of the department has made a few trips about the State to consult with farmers concerning weed problems, and has addressed a few meetings.

Dairy Industry

The major extension project of the Department of Dairy Industry has to do with the improvement of fluid-milk supplies. In this work the department deals, in a vital way, not only with the milk producers and consumers, but also with the distributors and the regulatory officials. Valuable service has been rendered to the people of the State through extensive surveys of the milk supplies of different cities, followed by constructive aid in the improvement of these supplies. Such work benefits directly every member of the community, and, in the end, doubly benefits the farmer through the increased interest of the general public. Of utmost value to the producer is the cooperative work of this department with the city health authorities, which has resulted in more rational milk ordinances and a more sympathetic attitude on the part of the health officers toward the farmer and his problems.

The extension professor of the department has served on the committee appointed by the New York Public Health Council to draw up the regulations covering milk and cream for the state sanitary code. He has also been appointed on a national committee to cooperate with the United States Public Health Service in the formulation of a "standard milk ordinance" for general adoption throughout the country. Already this ordinance has been adopted by fourteen States. Representation on these committees has offered the opportunity to present the producer's point of view and to have the regulations so cast as to avoid undue hardships to the farmer. The general adoption of these state and national ordinances will demand a greater amount of this type of extension work in the future.

Aside from the major extension activity of the department in the improvement of milk supplies, members of the staff are continually called upon to aid in specific problems which confront the dairy and food interests of the State. Much work has been done in helping producers, milk plants, and dairy manufacturers to introduce better methods and to overcome difficulties in the production and handling of their products. Such work enters the fields of general sanitation, chemistry, bacteriology, and food technology, in addition to milk production and dairy industry. Practically every member of the departmental staff has engaged in extension work of this nature in the past year. More than 2000 letters of an extension nature have been written by the staff during the year.

Entomology and Limnology

Control of insect pests. The Department of Entomology and Limnology attempts to benefit farmers in a practical way, through extended studies of the habits and methods of control of such injurious insect pests, under investigation now, as the following: (1) certain clover pests which curtail the production of clover seed, notably the clover-flower midge;

(2) certain insects injurious to the apple, including the apple maggot and four species of leaf rollers; (3) cutworms that injure various crops, notably grapes, cabbage, potatoes, and different muck and garden crops; (4) insect pests of the woodlot and of shade trees, particularly the white-pine weevil, the pine leaf-scale, the maple bladder-gall, and the dogwood scale; (5) certain household pests, notably cockroaches and fleas, with particular reference to control with calcium cyanide; (6) greenhouse pests of all kinds, and insects injurious to ornamentals and to house plants.

The aim of the extension work in the control of insect pests is to make available to the growers of the State accurate and practical information concerning the best methods of fighting the enemies of their crops. As the result of experimental work and of the practical experience of the growers themselves, more or less satisfactory methods for controlling most of the important injurious insects of the State are known. But to know how to control each kind of insect separately is not enough. All this information must be worked into a schedule of treatments for each crop grown. Such a schedule must be effective in protecting the crop not only from insects but from plant diseases as well; it must also be economic, so that its adoption will pay the grower; and it must fit into the general scheme of farm practices adopted by the grower. Schedules of this kind have been worked out in more or less detail for most of the cultivated plants grown commercially in New York. These include orchard fruits, small fruits, truck crops, potatoes, and fruit nursery stock. In the case of commercial greenhouse plants and ornamental nursery stock, there is still much to be done before satisfactory schedules can be made out suited to all conditions. In many cases this must await further experimental investigation.

The best schedules cannot be followed blindly. No two years are alike as to the relative abundance and importance of different insects. The proper time for application varies from season to season, and the combination of insecticides and fungicides must be adjusted to fit the situation as it actually exists at the time of application. In many cases the best method of treatment can be determined only by considering a number of factors, such as the development of the plant attacked, the abundance and stage of growth of the insect, the weather conditions, and the presence on the plant of other insects or plant diseases. If the advice given is to be safe and practical, all these things must be taken into consideration.

This, in brief, is the problem which the extension entomologist has to face. To meet this situation the extension workers in entomology and plant pathology have developed a joint project which has acquired the somewhat inexact name of "spray information service." In this system young men are employed as special field assistants in those counties where the interest is great enough to warrant it. These men have had special training in entomology and plant pathology, and are on duty usually from April 1 to September 30. They are appointed as assistant county agents and are responsible for all insect- and disease-control work undertaken by the county farm bureau.

Before the field assistants go to the field in the spring, a special training school of a week's duration is held for them and any county agents that care to are invited to attend. At this school an attempt is made to con-

sider all the more important problems of pest control likely to be encountered during the season. In conducting the school we have the assistance of the experimental workers in the experiment stations, the extension staff of the departments concerned, and a representative of the United States Weather Bureau.

During the season the members of the extension staff carefully supervise the activities of the field assistants. This is done by frequent visits by letter, and, at critical times, by telephone. A weekly news letter is issued each Monday giving information of immediate interest and the reports of the assistants on the development of the trees, the abundance of insects, the prevalence of diseases, and the general progress of control operations. The field assistant is in the field most of the time, keeping in close touch with the insect and disease situation and the development of the trees. With this information at hand he is able to advise the growers just when to apply the spray and just what to use. At critical times the extension specialists make it a point to meet with the assistants to help in deciding on just what to advise. The assistant also conducts a number of spraying demonstrations in different parts of the county. In the latter part of the season, fruit or potato tours are conducted at which the results are shown to the growers. At the end of the season the assistant prepares a final report on the season's work.

There is no way to estimate the benefit to the growers of the timely and accurate advice given out by the spray service year after year. In certain cases, however, it is possible to determine rather closely the saving made possible by the service. In 1926 it was found by the field men that the rosy aphid was not present in the orchards of the State. This finding was checked by the experiment-station workers, and the growers were advised to omit the nicotine in the delayed-dormant application. The value of the nicotine thus saved was nearly \$200,000. This year the San José scale was found to be so scarce in most orchards that it was advised to reduce the strength of lime-sulfur spray from 1 to 8 to 1 to 40, a saving of about \$4 per acre. As approximately 100,000 acres of apple orchards were involved, a considerable sum was saved by the growers.

Intensive work of this type is conducted in fourteen counties. These include the more important fruit-growing counties and Long Island, where the principal crop is potatoes. The same type of service, though on a less intensive scale, has been extended to the other counties as needed. In these cases the work is done through the regular county agent. In all of these counties the needs of the vegetable growers are met.

When insect injuries become apparent, it is usually too late to prevent loss. The work of the department is largely preventive. This is especially true in the case of orchard insects, and the central idea of the spray service is to anticipate outbreaks and advise the proper sprays in time to do the most good. That this work is appreciated by the growers is evidenced by the fact that last year the fourteen counties in which special field assistants were employed contributed \$18,435 locally to the enterprise. This is about 77 per cent of the entire cost aside from supervision.

Among cereal insects the importance of the Hessian fly as a menace to the wheat crop has necessitated a special method of procedure. During

the week before harvest, samples of wheat plants are collected from about two hundred fields in the wheat belt. These are examined and the percentage of infestation is determined for each county. This information is sent to the county agent in August in time to warn the wheat grower to sow after the fly-free date if the situation warrants it.

The prevention of wireworm injury to potatoes on the hills of the southern tier of counties also has been met in a special way. The best method of prevention is crop rotation. This is best brought home to the growers by getting the crop history of a few potato fields in a community, and then asking the growers to observe the percentage of injured potatoes under these different conditions.

The most pressing need for future development is to extend the spray-service system to the potato-growing counties. The method will probably have to be modified but the central idea will be the same — accurate and timely advice based on an intimate knowledge of local conditions. A step in this direction has been made in the organization of nearly forty spray rigs among potato growers. What the line of development will be is not yet clear.

In the vicinity of the larger cities there is an increasing demand for information concerning the control of greenhouse insects. A survey should be undertaken at once to determine what the more important problems are, and a plan worked out to meet the situation.

Educational work in connection with the clean-up campaign against the European corn borer has been conducted for the past two years on federal funds, and a man has been employed to give his entire time to the undertaking. With the failure of Congress to make an appropriation for this project, the task of continuing the work has been thrown on the regular staff. Three other new pests of first-class importance are invading the State and are beginning to require special attention from an educational standpoint. These are the oriental peach moth, the Japanese beetle, and the Mexican bean beetle. Some provision should be made at once to care for these special problems.

The present staff in charge of insect control is inadequate, consisting of one professor and one temporary assistant without field experience. It is with the utmost difficulty that the work can be maintained at its present standard. A thoroughly trained and fully competent instructor resigned in May to go to another institution. It has not yet been possible to engage a satisfactory man to take his place. The importance of the work requires more liberal financial support.

Apiculture. Due to the illness of the specialist, work in apiculture was discontinued on July 1, 1927. It was renewed on June 1, 1928, by the appointment of B. A. Slocum as specialist. In this interim only such meetings as were especially important could be attended. *Beekeeping News*, a monthly sheet of instructions to beekeepers, has been issued fairly regularly and will hereafter be continued regularly. The demonstration apiaries begun by the former specialist will be continued, and a few additional ones are proposed for those counties where commercial beekeeping is not developed at present. An effort will be made at once to revive the organizations of beekeepers which have become inactive because of lack of extension help from the College. During the year the State Society

of Beekeepers was reorganized on a regional basis, and plans are under way for assisting the extension work of the College by the holding of regional meetings in the nature of short courses. The society has abandoned its educational meetings as such, and has arranged to cooperate with the College in the holding of extension meetings of beekeepers.

The inspection service of the State has recently been entirely reorganized, the work being under the supervision of the Department of Agriculture and Markets. Plans are being perfected for cooperating with this service in the holding of meetings in regions where extensive inspection programs are being carried out, for the purpose of instructing beekeepers regarding diseases of bees. These meetings will be held in cooperation with the inspectors. A. C. Gould, of the College, has been appointed to administer the inspection work.

The Department of Agricultural Economics and Farm Management of the College is now making a study of the marketing of honey, in cooperation with the Bureau of Agricultural Economics of the Federal Department of Agriculture. This is the first careful attempt to make an analysis of honey markets and the work will be continued during the coming summer. Hereafter the marketing of honey will not be a part of the extension program in beekeeping, except as it will be possible to transmit the findings of the specialists in this work to beekeepers at their meetings.

During the past year a survey of the better beekeeping territories of the State was begun, in an effort to correlate beekeeping regions with various types of soil. This work will be continued with the ultimate aim of preparing a publication on the beekeeping regions of the State. No similar study has been undertaken in detail in any other State.

Aquiculture. Instructions with reference to the establishment of fish-rearing stations were given to several sportsmen's organizations. Likewise, several farmers were given advice in the stocking and management of farm ponds, either through correspondence or by consultation in the field.

Ornithology and mammalogy. The work in ornithology and mammalogy has been handled by a professor and an instructor on a part-time basis, their chief duties being resident instruction. In addition to the giving of numerous bird lectures at schools, granges, and various wild-life conferences, many photographs were taken to add to the collection of lantern slides in these meetings. Some additional motion-picture film was made. To ascertain the status of the ring-necked pheasant, especially in the counties of the western part of the State, it became necessary to spend considerable time in the field to determine the extent of damage being done to crops by birds. Many farmers had complained to their county agents that their losses from pheasants were severe and that they wished aid in obtaining permission to lessen this damage in some way. As a result of this field survey some relief may be given.

The work with rodents has consisted of experimental studies in the control of field mice and common moles. Additional data are being gathered to aid those who are undertaking fur farming with muskrats, foxes, and rabbits. Numerous bulletins and letters have been sent out in reply to inquiries regarding the raising or the control of the various birds

and mammals. A Farm and Home Week exhibit emphasized methods for the control of rodents.

Floriculture and Ornamental Horticulture

The extension work of the Department of Floriculture and Ornamental Horticulture this season was seriously interrupted by the illness of the extension specialist and his necessary absence over a period of four months. However, the close of the year sees practically all the new projects completed. Progress on bulletins was practically stopped, but the correspondence and the office work, which were unusually heavy, were kept up.

Unquestionably the most significant accomplishment this season was the organization of material and the initiation of a four-years progress project for the girls and boys in junior club work. This project was launched in April, and it was hoped that until it had been tested only a small number would enlist. However, the project will undoubtedly be more popular than was anticipated, for at the end of May more than 500 girls and boys had been enrolled in four counties.

The next most important piece of work was accomplished in the town of Newark. The organized nurserymen of New York State desired the aid of the extension specialist to train them and their sales agents. In the past, most nurserymen have been interested in selling materials without regard to their suitability and with the desire to sell as many plants as possible. Eighty-five per cent of all nursery stock sold goes to the small home owner. The work which these nurserymen have done in selling this large amount of material has not brought satisfaction to the people. All this the nurserymen themselves recognize. The extension work of this department had been definitely felt by the nurserymen, and they found it necessary to ask that they be given a special course in simple landscape arrangement in order that the work they do might be in harmony with the teaching of the College. A specialist was therefore assigned, and he conducted a one-week extension school at Newark. The results of this were most satisfactory. Practically all the up-state nurseries were represented and many of them had called in their sales agents. These men were instructed in the details of proper landscape planting for the average home. Sales methods and quality of materials were discussed, the results being that many of these nurseries have completely changed their policies. All this work was carried on in conjunction with the civic organization of the town of Newark, and, in addition to what has already been mentioned, a tremendous amount of improvement work was accomplished in the town. One library, three schools, two parks, one factory, and thirty-two private homes, were given suggestions for planting and the work was practically completed by the end of the week. In addition a garden club was organized and a street-tree ordinance was drawn up and adopted by the town.

During the season, Junior Extension Bulletin 27, entitled *Home Planting for Boys and Girls*, was published, and the manuscripts for bulletins on the following three subjects were completed: planning the farmstead; ornamental woody plants for every purpose; the art of planting and

transplanting woody plants. From the office 1265 letters of information and 2 circular letters were sent out, and 7 reports and 39 plans were made. One mimeographed bulletin was revised, and a new one, on compost heaps, was prepared.

During the coming year the regular extension activities should be continued, but clear emphasis should be placed on two lines of work. First, the junior club work should be carried on and developed to a greater degree. In order that this may be properly done, an assistant specialist should give considerable time to the project. Secondly, the improvement of school grounds should be emphasized. Cooperation with the State Department of Education should be arranged and a systematic program of placing well-developed school grounds at important places in each school district should be conducted. Lectures should be given to the district superintendents of schools and to their teachers at their conventions and conferences.

Forestry

The outstanding extension activities of the Department of Forestry during the past year have centered around the forestry project for 4-H Club boys and girls, and the increase of demonstration areas under woodlot management.

The forestry project for 4-H Club members was started in 1926 with an enrollment of 90 members. In 1927 this was increased to 560, and this year it showed a further increase to 758. Practically 750,000 trees were planted by 4-H boys and girls, since each member must plant 1000 trees to qualify in the first-year forestry project.

In addition, more than 100 boys and girls who took part in the first-year work enrolled in the second-year project in forest appreciation. As a result, very nearly 1000 boys and girls are doing some constructive forestry work in the State this year.

Special illustrated bulletins have been prepared covering the first two years of work in forestry, and have been distributed. These are Junior Extension Bulletin 26, *Fifty Common Trees of New York*, and Junior Extension Bulletin 28, *Hand-planting Forests*. Bulletins covering the third and fourth years in woodlot management and timber estimating will be prepared as the demand arises.

Two years ago a definite plan was set up to bring about better woodlot management in New York. This involved the establishing of demonstration areas in selected communities throughout the State. In 1927 eleven such demonstrations were held, and in the year just closing there were twenty-one. This increase is very gratifying, as it indicates real interest in matters pertaining to woodlot management.

The timber-marking work conducted by the department on these demonstrations netted an average return of \$59 per acre.

The extension forester is constantly seeking opportunity to work with responsible groups in the several counties, striving for the development of a coordinated plan of forestry activities within the county which will include all interests and organizations. Such a council was created in Chautauqua County in 1927, and three more have been added this year in Erie, Schuyler, and Lewis Counties.

It is believed that the forestry-council idea is the right method of approach to the many phases of forestry problems in a county. It will not always lead to the employment of a county forester, as has happened in Chautauqua and Erie Counties, but it does lead to the development of a sound policy on which a program can be based.

Under the cooperative agreement between the Federal Government and the State of New York for the control of the white-pine blister rust, the extension forester represents the New York State College of Agriculture in the selection of the blister-rust control agents and advises with them with regard to the presentation of subject matter in their work. This interrelation between state departments coordinates these various phases of extension activity.

As a means of arousing and maintaining the interest of the public, and especially in that it leads to the making of desirable contacts, considerable effort is directed each year to the preparation of effective forestry exhibits for use at the College during the annual Farm and Home Week in February, and later in the year, in August, as a part of the general exhibit of the College at the State Fair at Syracuse. A year ago, proper care of the farm woodlot was featured by a cleverly executed diorama in which a bit of actual forest, set against a painted background, was brought into one of the rooms in Fernow Hall for Farmers' Week and subsequently was set up again at the State Fair. In a similar way, this year the exhibit portrayed a woodlot, a part of which was grazed and a part under fence. The contrast between the conditions on the two sides of the boundary fence revealed in a striking degree the damage caused by cattle in the forest. The lectures by the several members of the departmental staff during Farm and Home Week stressed the various aspects of grazing in its relation to the forest.

Besides the publications in the junior extension series, already noted, there came from the department in 1928 a contribution entitled *The Production of Maple Sirup and Sugar in New York State* (Extension Bulletin 167). It is believed that this bulletin will be of value to those who own or are interested in sugar bushes.

To answer questions that are frequently asked, and to keep those with whom he cooperates, and especially the county agents, in close touch with recent developments, the extension forester puts out not a little material in mimeographed form. Another phase of the extension work is the preparation of material of interest and news value for distribution to the newspapers of the State, through the medium of the information service of the College or through the *Farm Bureau News* in various counties. Several of the forestry articles have had a wide circulation and many printings.

The demands made upon the extension workers of the department increase both in number and in scope with each passing year. The outstanding need of the department at the present time is for another properly trained and qualified extension man to assist the extension forester in further developing the projects. During 1927-28 a graduate student has served effectively as part-time extension assistant. Much of his work was in connection with 4-H Club projects.

Meteorology

Owing to the small staff, extension work in the Department of Meteorology is limited to local meetings. Talks on weather and climatic conditions, and on the principles and methods of forecasting, have been given before farmers' meetings and Boy Scout gatherings, and at Junior Field Days.

Plant Breeding

The major problems of extension work in the Department of Plant Breeding are concerned with bringing about the general use of those varieties and strains (of farm crops) which adequate tests have shown to be especially adapted to the conditions of New York agriculture. These problems are necessarily of two types: first, problems concerned with effecting a more general appreciation of the significance of heredity in seeds, and with effecting action as a result of this appreciation; secondly, problems of production of high-quality seed of the improved varieties and strains. The satisfactory solution of the second group of problems is fundamental to the solution of the first group or to making possible the satisfaction of wants created.

Therefore, since the production and distribution of good seed is fundamental to the use of good seed, the extension workers in plant breeding provide considerable service to seed growers. Such special service has been largely confined to members of the New York Seed Improvement Cooperative Association, in accordance with the announced policy of the College to limit college inspection of fields, and of seeds grown for certification for commercial purposes, to members of that association. During the past year frequent aid has been rendered the association in formulating standards and policies, in organizing meetings, in systematizing records and reports, and in supervising the preparation of certified-seed-source lists. These services are in addition to the actual inspection activities performed for the association. In the summer of 1927 there was an increase, over that of 1926, of 23.3 per cent in the acreage of seed-grain crops inspected for members of the association. This increased acreage was accompanied by an increase in the number of reclaimed seed samples examined and reported for certification purposes.

Accompanying the increased acreages of seed grains grown for certification, there was a gratifying and noteworthy improvement in the quality of seed grains as produced by members of the association. These growers have been generally quick to act upon suggestions which have been made toward solutions of their seed-production problems. As a result the quality of certified seed has tended to be higher from year to year.

The establishment of foundation seed plots by a few members of the association has been fostered. With the aid of the Department of Plant Pathology of the College, seed for these plots has been carefully treated. Seed from these foundation plots is used for the production of the highest-quality certified seed.

During the early fall of 1927, service was given to growers of certified seed corn in developing methods of artificial drying. The assistance rendered in this project by the Department of Rural Engineering of the College was immediately productive of excellent results. The application of

the suggestions given resulted in an unusually high amount of seed corn meeting the certification requirements as to germination, although the inspected acreage of corn was the smallest in the history of the association.

As a result of several conferences with farmers of Cayuga County, complete plans were formulated in the late winter for modification of succeeding crop contests so as to comply with the policy of the College concerning the inspection of seed crops and seeds. It is hoped that the new rules and regulations will extend the influence and effectiveness of this farm-bureau project. Already there is developing in Cayuga County a definite campaign to enlist those whose conditions justify the enterprise, in a county-wide program of production of high-quality certified seed.

It has been satisfactorily demonstrated that strains of potatoes, hereditarily different in regard to their ability to yield, may be isolated on a given farm. As a result of the increased appreciation of this situation, many additional applications for aid in conducting selection plots have been received. A carefully considered program has been formulated for the prosecution of this project in future years, and for the comparative testing of the strains isolated on the farms of several cooperators who have conducted breeding plots over a period of years. The policy has been definitely established to limit this project, in so far as possible, to those men who are already growing high-quality certified seed potatoes and who will sell their produce to other growers for further increase under certification. These cooperators will be selected from a group of men who have shown an aptitude for this work. By concentrating our activities on this smaller group of specialized growers, it is hoped to develop superior foundation stocks of the four types of potatoes commonly grown in New York.

During the year there have been several significant developments with regard to bringing about a wider appreciation of the significance of heredity in seeds, and a wider use of seeds of the varieties recommended by the College.

A planting in 1927 of 183 samples of corn as sold by various dealers in this State emphatically demonstrated the conditions of serious abuse and confusion of varietal names as applied to seed corn being sold to New York farmers. Many of the dealers who cooperated in this demonstration have been materially aided in choosing varieties and strains of corn best adapted to communities served by them. Due to the favorable reactions of seed dealers, this project is being continued and enlarged in 1928.

Specialists from this department were called upon to present information on good seed at a markedly increased number of community meetings. Not only has the interest in high-quality seed increased, but there is now available sound experimental evidence on which to base recommendations, and increasing supplies of good seed of the superior varieties and strains. These conditions justify considerable extension of the community meetings, at which discussions on the characteristics of good seed and on the varietal and strain recommendations may be presented. During the past winter such discussions were held at twelve county schools of local seed dealers. Most farmers come to their local dealers for seed supplies. The local dealer, therefore, is distinctly in need of the information which the

College possesses, because it is true that, in the long run, seed that is good for the farmer to use is seed that is good for the local dealer to distribute. If the local dealer possesses the information and is attempting to give service on this information, he can fulfill the demands of his clientele, who ask for materials recommended by the College; and, furthermore, he is in a position to advise many farmers as to the best types of seed to be used in that particular community. Such local dealers, therefore, become an effective link in the extension service of the College.

A mimeographed circular on the seed recommendations of the department was found to be effective in summarizing discussions and in answering correspondence.

That there was an increased demand for seed of the recommended varieties in 1927-28 is not to be questioned. Some of this increased demand can be traced to wider presentation of the available information. In the spring of 1928, high-quality seed of the recommended varieties of farm crops was exhausted unusually early. Producers of certified-seed grains, and other growers, could have sold several times their available supplies in some cases. Much of this increased demand came from dealers with whom contacts had been made during the year.

Two extension representatives of the department serve on the Cornell Seed Conference Board, which was organized in January, 1928, to advise with seed distributors concerning their seed programs, and to provide a means for exchange of information and ideas between the various departments especially interested in the production and use of better seed. As secretary of this board, one representative of the department will be called upon to conduct considerable correspondence and to keep adequate records.

During the winter and spring of 1928, representatives of the department have assisted in the preparation of suggested principles relating to the making of exhibits, judging, and other educational features of county fairs. The preparation of suggested premium lists covering those crops in which this department is interested is in progress.

The regional tests of oats, barley, and corn varieties were continued in 1927. In the spring of 1928, similar tests were started with alfalfa varieties. These regional tests provide most valuable information on the yields and adaptations of varieties to the diversity of conditions of soil and climate in New York. At dealer schools and community meetings, the information obtained from such tests has enabled the specialist from the department to speak with considerable authority as to the comparative results obtained from different varieties in that particular section of the State.

Plant Pathology

Considerable attention is being given by the Department of Plant Pathology to increasing the effectiveness of its extension work. The object is to provide the farmers of New York with the information and service which they need and desire in respect to the practical control of plant diseases. The department aims, in so far as is possible, to determine in advance of their occurrence what diseases may become prevalent and destructive, and to fortify the growers against them. There is demanded in this type of service a careful and continuous plant-disease

survey, with frequent entrance into the realms of investigational work by the extension staff in order that they may acquire the needed information on which to base their recommendations.

This year the demand for aid on projects that have been under way for some time has been insistent and indicative of confidence on the part of the farmers. This demand has been increased by at least two factors: the more cheerful outlook of farmers after the long-continued period of agricultural depression; and the farmers' greater realization that only high-yielding crops can reduce materially the cost of production.

Fruit-disease control. Perhaps the most outstanding feature of the department's extension work is the spray information service, which is a joint project of this department and the Department of Entomology and Limnology. The details of this project have been given in reports of previous years. Although supported largely by the fruit growers, the spray service has become more than merely a service to those farmers who, recognizing its value, so willingly contribute to its financial support. As a conservative estimate, from two-thirds to three-fourths of the fruit acreage of the State, including practically every commercial planting, is sprayed according to the recommendations of the men in our spray service. Results have been economically significant. For example, it has been the rule in the past to make the first apple spray with a concentrated solution of lime-sulfur. Our knowledge of the concentrations needed for the control of the several diseases and insect pests as determined by the research workers, together with information on their prevalence as determined by the field men and specialists, has shown definitely that it would be safe to recommend a dilute solution this season. The saving to the growers in this one practice will probably amount to \$4 per acre for the 100,000 acres of apples sprayed according to our recommendations. This saving alone is more than would be needed to run the extension service in this department for ten years. One specialist, through keeping a continuous record of the development of the fruit-disease-producing fungi, from material which he collects and receives daily from the field men, so shapes the recommendations to the growers that the most economical use of materials and labor, consistent with a high quality of fruit, can be made. Fruit of a high quality, made necessary by competition and the demands of the consumer, can be produced only by intelligent spray practices; and the New York fruit grower will not be satisfied to return to the hit-and-miss methods in vogue before the inauguration of our special spray service. This is an outstanding example of the bringing-together of the grower and the laboratory worker, through the medium of the farm-bureau organization, the field worker, and the specialist. The success of this highly organized extension project is being watched and tried by a number of other States, one result of which is the loss of our workers through competition with other States for their services.

At present there are fourteen counties with a definite spray service, and in all the other counties where there is fruit the county agricultural agent is assisted by the department's representative in issuing spray letters, making personal visits, and carrying on the work in so far as time will permit.

Potato-disease control. The second most important part of the extension work in plant pathology is in connection with potato-disease con-

trol. In this there has been an unusual increase in interest among the growers. The farmer is realizing more strongly each year that he must have healthy, high-yielding stock, to compete with growers in neighboring States. Consequently there never before has been such a demand for certified seed, for advice in seed treatment, and for assistance in organizing potato-spray rings.

For a number of years emphasis was placed on obtaining healthy seed, particularly in the counties bordering on the large lakes. In one community where a meeting was held, five carloads of certified seed were bought. In other communities also interest was aroused, so that all the certified Smooth Rurals grown in the State were sold by Christmas time. Many more could have been sold had they been available. This demand has increased the 1928 acreage of certified seed in the State.

Potato-seed treatment always has been stressed, but, because of the slow, cumbersome method, only about one-fourth of the growers have heretofore practiced it. Last year the faster "hot-dip" was started in several counties and about 50,000 bushels of seed potatoes were treated in community vats. The demand for this method of treatment increased, so that more than 100,000 bushels were treated this spring. This increase alone would be sufficient to plant 8000 acres, and, since it has been shown over a long period that treating will increase the yield 25 bushels an acre, the total increase would be more than 200,000 bushels. But this has not been the only increase in treating, for very many farmers bought organic compounds to treat their potato seed. A relatively large share of the office correspondence during the spring consisted in giving individuals advice regarding the use of these compounds. It would seem safe to say that outside of Long Island (where treating has not yet been proved to be profitable) 70 per cent of the potato growers in the State now treat their seed stock.

In 1926 there were three spray rings in the State; in 1927, thirteen; and in 1928 there will be approximately forty, with every indication that in 1929 there will be one hundred. Forty spray rings represent about 600 growers or nearly 3000 acres. The average increase from spraying in such rings has been 51 bushels an acre, which means approximately 150,000 bushels for all the rings. This does not represent the whole increase from spraying, for, in each community where there is a spray ring, certain individuals are led to buy their own sprayers.

The seed-source demonstrations on Long Island were conducted again in 1927. They are extremely important, as they give both the grower and the buyer an exact method of comparing their seed-stock strain with many others obtained from various States and from Canada.

In order to carry on the potato work the following activities were necessary: method demonstrations 5, extension schools 4, field meetings 7, tours 9, conferences 5, lectures 27, community meetings 15, farm visits 53, news articles 2, service letters 5, one-page leaflets 7780, and miscellaneous activities 12 days. The last-named does not include a conference of potato inspectors held at Freehold, New Jersey, and attended by three men of the department.

Potato inspection. Inspections during 1927 were made for 156 potato growers with a total acreage of 1575. There were found eligible for

certification 1294 acres with a total production of 323,000 bushels. These figures represent an increase over the preceding year of about 25 per cent. Present prospects indicate a further increase in acreage for 1928 of about another 25 per cent.

Two inspectors were employed in 1926 and in 1927. Previous to 1926 it had been usual to employ three inspectors. In 1928 three inspectors will be employed, owing to changes in personnel and to an increased amount of work.

Florida test. In 1928, twenty seed sources were tested as to freedom from virus diseases by growing a sample from each as an early crop in Florida. The results from the test were made available to all seed growers by April 1. This has enabled a few men to alter their planting plans for the better. The demand for certified seed has been so great, however, that in most cases growers have not been able to make changes in their seed which the test would indicate as desirable. Arrangements are now being made for the possible transfer of the test to Bermuda, which would allow the results to become available a month or six weeks earlier.

Vegetable-disease control. It has taken considerable time to awaken the vegetable grower to the fact that not only should he mark down his disease item in the loss column, but he should also do something to eliminate the losses. This change of practice has been slow and at many times discouraging work, but gratifying results are gradually being obtained, even though there is still much to be done.

One of the important means of keeping the vegetable men informed of disease trouble was the vegetable service letters. In 1926, slightly more than 5000 of these letters were sent to men who requested them; in 1927 the number increased to 25,000, and in 1928 the number of requests amounted to 59,294.

The bean growers have had heavy losses of their Red Kidney beans by attacks of the bacterial blight. No strains of this variety are resistant and all New-York-grown seed is badly infected. It was found that certain sections of California, because of their weather conditions, could grow disease-free stock. In 1927 a small amount of this seed was introduced, to test its qualities. It proved so good that on the advice of the Departments of Vegetable Gardening and Plant Pathology of the College, nearly every acre of Red Kidney beans in the State is now planted with California-grown seed. If the season should prove favorable for the spread of blight, this would mean a saving of from \$100,000 to \$300,000 on the 25,000 acres grown in the State.

Cucumber growing has increased rapidly in the Ontario Lake region during the past two years. Consequently a survey was made last summer to determine the percentages of disease and to outline a program of control measures. During the winter, community meetings were held in which the various diseases were discussed and control measures were recommended. The result was that most of the pickle contractors agreed to cooperate in treating the seed, and also in helping to get dusting or spraying started. The seed was treated this spring for two companies, representing at least 75 per cent of the growers in Monroe County and probably 20 per cent of those in Wayne County. Smaller amounts

of seed were treated in the remaining cucumber sections, in Erie, Chautauqua, Ontario, and Schenectady Counties. Also, arrangements were made in the counties where there are field assistants to have demonstrations on the control of cucurbit mosaic by eradicating certain perennial weeds that transmit the disease.

Damping-off of seedlings is another disease that has received much attention in the past three years. The control practices have become fairly well established, and some of the growers who raise young plants extensively have given very favorable testimonials to the results obtained. One man at Sheridan (Chautauqua County) states that he had frequently lost as many as 100,000 plants, and that now he loses less than 1 per cent. Another grower in Schenectady County, who almost despaired of growing young plants, affirms that he has not lost any for the past two seasons because he followed the recommendations of the department.

Streak of tomatoes is very severe in many greenhouses. Recommendations were made at Irondequoit (Monroe County) to one grower who feels that he saved \$1000 by following them. So striking were the results that nearly every grower in the district is adopting the same practice this season.

Emphasis has been placed on control measures of the diseases of many other crops. In this work the following activities are enumerated: method demonstrations 1, extension schools 1, institutes 1, conferences 1, lectures 4, community meetings 2, farm visits 114, news articles 2, one-page leaflets 4870, and vegetable service letters 18 (circulation about 50,000).

The plant-disease survey, in which this department cooperates with the United States Department of Agriculture, as usual was much neglected because of lack of time. It should be one of the principal activities of extension, for it gives a basis for the next year's program. Information on about 300 diseases was obtained and tabulated. Much more material should have been gathered.

In addition to the extension work conducted by members of the extension staff, other members of the departmental staff have contributed their services from time to time in giving lectures at Farm and Home Week, at the special school for field assistants, at the meeting of the New York State Horticultural Society, and at county meetings, and have advised the extension men in respect to their work. Members of the staff of the State Experiment Station at Geneva also have contributed to our extension work in various ways. The fellowship men and other investigators in the field have effectively cooperated with our field assistants.

Pomology

The long-time program for the extension work of the Department of Pomology includes the following subprojects which touch the various phases of the fruit industry of the State: pruning fruit trees; orchard-soil fertility; grafting fruit trees; thinning fruit; establishment and management of orchards; grading and packing; fruit packing-houses; small fruits; grapes; home fruit improvement.

The immediate program which was followed in 1927-28 has been specifically worked out in conference with the fruit committees of the farm bureaus appointed to study the apple situation. Emphasis was placed upon the following subjects:

1. Elimination of unprofitable acreage and trees:
Lectures: (a) Location, soil, and variety as factors in successful orcharding.
(b) Adjustments that will help meet the fruit situation.
Demonstrations: Top-working apples and pears (April-May).
2. Economy in orchard management:
Lectures: (a) Cultivation of the orchard to meet present economic conditions.
(b) Growing apple trees successfully in sod.
(c) Natural and chemical fertilizers for the orchard.
Demonstrations: Applications of nitrogenous fertilizers in suitable orchards (April).
3. Pruning and thinning:
Lectures: (a) Pruning apple trees (lantern-slide lectures).
(b) Thinning to improve the size and quality of fruit.
Demonstrations: (a) Pruning demonstrations in commercial orchards.
(b) Pruning heavily loaded trees (June 20 to July 10).
4. Better handling and packing methods:
Lectures: (a) The fruit harvest.
(b) Grading and packing methods.
(c) Harvesting and storage.
(d) Packing-house management.
Demonstrations: (Conducted in late summer and early fall).

Economy in orchard management, and pruning, were among the most popular subjects presented at meetings and demonstrations. The interest at the meetings has been keen and the attendance satisfactory. At a series of twenty-four well-planned and well-advertised meetings held in Niagara County during the past winter, the average attendance at each lecture was 41. Illustrated lectures on pruning held in Columbia County drew an average attendance of 89. The total number of community meetings and demonstrations was considerably increased over that of 1926-27, with a high average attendance.

The fertilizer demonstrations continue to show striking results from the application of nitrogen in sod orchards. For example, in an orchard demonstration in Yates County where nitrate of soda has been applied for two years, one plot of fertilized trees gave an average yield of 9 bushels per tree, another plot 13 bushels, and the check plot 3 bushels. The effect of two years' application of nitrogen to a demonstration orchard in sod in Orleans County resulted in an average yield in 1926 of 4 barrels per tree for fertilized trees and 3.3 barrels for check trees. Comparable figures for 1927 were 2.9 barrels and 0.75 barrel, respectively.

The farm-bureau agents report that fruit growers are accepting and putting into practice, as never before, the teachings of the fruit specialists from the College. These gratifying expressions of confidence in the extension work help to emphasize the need for more research and for a great fund of dependable knowledge. The growers who attend our meetings year after year have long ceased to come out of curiosity, and they are familiar with the general store of information. The greatest interest is shown in the technical discussions of the recent subject-matter developments.

In order to properly and faithfully serve such a clientele, the extension specialists should have ample time to keep up with the literature, and, if possible, to participate to some extent in certain phases of the research program if fitted to do so by training and inclination.

Poultry Husbandry

To lay emphasis upon a few phases of the year's extension work of the Department of Poultry Husbandry as outstanding, is difficult. All are regarded important. The extension program in poultry is ever forward. The following developments during the year are significant:

1. The new plan whereby each specialist is scheduled sectionally for the purpose of building, planning, and carrying through, types of poultry work particularly needed in any county, and of functioning more efficiently because of better acquaintance and knowledge developed by closer contacts.

2. The marketing school, which functioned largely as a training school for state inspectors employed by the State Department of Agriculture and Markets as inspectors under the new egg law.

3. The decline of culling demonstrations, which is encouraging as it reflects the results of strenuous educational campaigns on the part of the department in related lines of activity, such as the judging school, paid culling, and certification.

4. The development of the home record-of-performance work in the State as a further valuable addition to the breeding program. This includes 31 cooperators, trap-nesting about 7000 birds.

5. The home egg-laying contest, which in its initial stages is promising. This represents 398 persons keeping records and reporting through the county agents. Their reports are mailed monthly to their county farm bureau; the bureau makes a county report, after which the original reports are sent to the department where a state-wide report is made.

6. The continuation of the "Market Review" and the "Nest Egg." The "Market Review" is sent to a mailing list of 1000, and the "Nest Egg" to about 10,000.

Rural Education

Preparation and publication of the Cornell Rural School Leaflet constitutes the largest single extension activity of the Department of Rural Education. The September issue for the past year contained 144 pages; the November issue, 48 pages; the January issue, 48 pages; and the March issue, 36 pages. The Leaflet has come to have a very important place in rural schools, and is becoming more widely used each year.

Practically every member of the staff responds to numerous calls for lectures to parent-teacher associations and similar organizations, including both local units and state associations in this and various other States, as well as national organizations. Members of the department also visit graduates of the College who are teaching in New York State, to aid them in adjusting themselves to their work. (A further report of this work may be found in the general statement regarding the Department of Rural Education under the resident-instruction section, pages 46 to 55.)

Some idea of the national reputation which this department enjoys may be gleaned from the following sample list of a few out-of-state invitations to which members of the staff have been able to respond: to direct the Rural Education Section of the Virginia School Survey; to conduct in the summer of 1927 a two-weeks course at the University of Kentucky, in which all the agricultural teachers of that State were enrolled; to conduct a similar two-weeks course at West Virginia University; to serve as president of the National Council of Supervisors of Nature Study and Gardening, in Boston, Massachusetts; to serve as chairman of a Committee of the American Vocational Association, as chairman of the Committee on Agricultural Education of the National Committee on Advanced Courses in Vocational Education, and as chairman of the Advisory Committee on Teacher Training in Vocational Education for the Survey of Land-Grant Colleges; to give addresses at meetings of the New York State Teachers Association (Southern Section), the Virginia State Teachers' Association, the Kansas State Teachers Association, and the State Teachers Colleges of Wisconsin at Superior, Whitewater, and La Crosse, at the meeting of the Department of Superintendence of the National Educational Association in Boston, at the Pennsylvania East Central Teachers Institute, at the International 4-H Club Training Course in Springfield, Massachusetts, at the National 4-H Club Leaders' Conference in Washington, D. C., and at a similar state conference in Burlington, Vermont, and at the annual meeting of the American Vocational Association in Los Angeles.

Rural Engineering

The extension work of the Department of Rural Engineering has been conducted by three full-time specialists and six part-time assistants.

Interest in drainage work was greater in the past year than for any other year since the World War. As a result of 54 demonstrations attended by 108 farmers, 137 farm visits in 20 counties, and 1 demonstration lecture attended by 7 farmers, there have been laid in the State through our aid approximately 16,000 rods of tile drains on about 900 acres of land, and approximately 10,000 rods of open ditch to drain about 2000 acres of unproductive land. Greater results would have been accomplished if the emergency corn-borer work had not occupied part of the time of our engineers.

Gas-engine and other farm- and home-machinery schools were held as follows: farm blacksmithing, 69; three-day gas-engine, 5; two-day gas-engine, 1; one-day gas-engine, 11; tractor, 9; three-day shop, 6; two-day shop, 3; one-day shop, 64; one-day sewing-machine, 76; total, 244. The 76 sewing-machine schools were held in 22 counties, with 1039 women attending and a total of 708 sewing machines overhauled and adjusted. It is unnecessary to discuss at length the good that these schools do. Without question, satisfactory results have been obtained, practices have been changed, equipment has been repaired and improved, new construction has been guided, and various skills have been mastered by the persons reached.

The following single-session meetings were held: water-power, 1, attendance 4; farm-machinery, 5, attendance 825; water-supply and sewage-disposal, 5, attendance 39; barn-ventilation, 47, attendance 951; drainage, 1, attendance 7; total, 59 meetings, attendance 1826. For water supply and sewage disposal, in addition to the single-session meetings listed, 177 farm

visits were made and 60 demonstration meetings were held in 25 counties before 231 persons.

On farm structures, only a fraction of the much-needed work has been done. The decided shift of the dairy industry to produce fluid milk that can go to any market calls for revised buildings, and many unfortunate mistakes in permanent construction could be avoided if the department had more help to push this service. The results of our research on ventilation and on milk-house construction, and sound advice on building rearrangement and on concrete-floor construction, are very much needed by the farmers of the State.

Corn-borer control. As a part of the national emergency activity for the control of the European corn borer, this department rendered loyal assistance. Its work emphasized the accepted means of immediate control, as follows: (1) cutting corn low and early; (2) placing all corn possible in the silo or shredding finely; (3) plowing all stalks and stubble so effectively that all parts of the corn plant and trash are completely covered with earth; (4) cleaning fields, feed lots, barnyards, and poultry yards, of all parts of the corn plant, and burning them; (5) use of tillage implements that do not tend to bring buried material to the surface.

Two engineers from this department were assigned to carry out the educational demonstrations to show how best to attain the above-outlined objectives. They enlisted the active cooperation of all available agencies, and, by the simultaneous running of two sets of demonstrations, much good was done in the brief time available in the spring. This emergency service is, it is hoped, but the forerunner of consistent demonstration work to revive among the farmers of the State that pride and skill in plowing which makes for good plowing as well as for corn-borer control.

In the fall a campaign to demonstrate the possibilities of low cutting, and to emphasize the advantages of that practice, was carried on in 9 counties at 37 demonstrations with an attendance of 508. Three makes of harvesters were used as equally as possible at the meetings, in order to avoid any criticism for favoritism.

4-H Club work. The aim of the work with 4-H Clubs is to induce the younger generation to take a more active interest in farm life by teaching them various mechanical skills which are always of value on the farm. The lessons offered are such that they will be of value to the student now and will form a background for further study, thus tending to establish higher standards of living. The project is organized around three main activities: shop work, woodworking, and gas-engine operation. The material covered is much the same as for regular extension schools of this type, except that it is arranged with great care to give the practicums a maximum of effectiveness under the necessary system of administration. Organization meetings also are conducted with great care. Later, exercises done under local leaders are promptly and carefully corrected when sent in to the College, and energetic follow-up work maintains the esprit de corps and insures a maximum of completions.

There were clubs as follows: shop clubs, 37 in 14 counties, starting with 599 boys; woodworking, 18 in 10 counties, starting with 265 boys; gas-engine operation, 1 in 1 county, starting with 13 boys.

This is one of the most hopeful lines of extension teaching, and it is being given the energetic administration which it deserves.

Rural Social Organization

The Department of Rural Social Organization deals with the community life of the countryside, which runs hand in hand with its economic life. The farmer is concerned not only with running his farm on the one hand and managing the home on the other, but also with the collective or group enterprises which are usually spoken of as "community work." This department concerns itself with this latter activity. Much of the success of the economic and homemaking enterprises depends upon the community's ability to work together. This department specializes in the technic of the community working together, which we call "rural social organization."

The growth of the extension work in this department has been gradual. In the year 1920-21 the total number of days spent in field work was 93; in 1921-22 it was 85; in 1922-23 it was 149; then for the past five years it has been, respectively, 232, 264, 253, 216, and 212. The reason for the apparent drop in the last two years is due to the fact that farmers' substitute work was not included in the totals for those years. The regular work, however, has had a steady growth.

It is estimated that the department meets less than three-fourths of the requests that come to it for help. This is due, of course, to an insufficient number of extension specialists. Last year the extension professor, in trying to meet the requests that came in, spent so many days in the field that important office duties including a large amount of correspondence and preparation of printed material had to be neglected.

The new phases in the work of the department this year include: the development of a year-round recreational program for 4-H Clubs, in two counties; the promotion of county-wide programs of building rural school playgrounds, in two counties; the directing of a successful campaign for a rural library, with a full-time librarian and a book truck, in one county; the promotion of a county-wide rural musical and story-telling festival, in one county; and the circulation of material for debates to be used in granges.

That part of the work of the extension professor which consisted in helping local groups in the task of carrying through various community projects or activities, such as those in the field of recreation, health, beautification, or civics, occupied 78 per cent of his time. This subject is called "community organization." Such activities as the following came within its scope during the year: installing school playground equipment; installing an electric railway-crossing signal; investigating the local motion-picture situation; beautifying the grounds around the church, the school, and the town hall; incorporating a village; planning a village park; planning a school library; organizing a village fire department; organizing 4-H Clubs and Girl Scouts; making plans and specifications for a parish house; remodeling a parish house; making plans for a firemen's hall; making an abandoned church into a community house; and organizing a neighborhood so as to get electricity from a long power line. This is only a partial list of the activities undertaken. The extension professor held 169 meetings during the year attended by 261 persons, and 79 per cent of his meetings were in this field of

community organization. A description of a few of these meetings will illustrate the method of work.

At one county-wide school for recreation leaders, a committee of three representatives from a certain small village had dinner with the specialist, taking this opportunity to tell him about their community problems. Their need seemed to be for a social hall. They complained that they could not build a new hall, and so the situation was discussed relative to remodeling some old building. They finally admitted that they had an abandoned distillery and a bonded warehouse, neither of which had been used since the Volstead Law went into effect. The owner of these two buildings was reached by telephone and an interview was arranged. That evening the owner told the committee that he would donate his two buildings for a social hall. The next step was to make a study of the community to see what institution should own and operate the social hall. The Methodist Church was the only incorporated group there for holding property, and so the old distillery and the warehouse were moved back of the church and remodeled for the use of a social hall or parish house. This local project required three visits of the extension professor.

In another and a very small and scattered farming neighborhood, a meeting was held in an old abandoned brick church. The people present were much discouraged. Their "school was small," their "church was dead," they were "hard up" financially, and the young people were "all leaving for the city." A home-talent play was first arranged. A stage was built in one end of the old church, over the top of the platform and the altar rail. Uprights, wire, and curtains were installed, and the play itself was soon ready. The old church was packed, and chairs were added to seat the audience of more than 300 who witnessed it. Having gained confidence by this successful venture, the inhabitants next discussed, at one of the meetings with the extension specialist, the desirability of getting electricity on their farms. Two mass meetings were held, and within six weeks the poles were being set and the contracts with a large power company had been signed. In view of the fact that the people said they "had been talking about getting electricity for twenty years" but had been "waiting for it to come through," one sees that the work of this department is needed to help many similar communities get started. Only about half of the meetings of the specialist in this work are successful in getting something accomplished. When the technic in community organization is better developed, a better record of success can be expected.

The 900 granges in the State, with large memberships, often 200, present a great opportunity for the cooperation of this department. More and more the department is working with the granges, usually through the Pomona Grange, in trying thus to help the subordinate granges to undertake larger practical programs. An illustration of such work is given in a visit made to the Pomona Grange of Suffolk County. The afternoon was spent in a two-hours discussion of how to discover various local community problems and how to organize as a grange to undertake some community project. The Pomona lecturer, who is a teacher of agriculture, announced that he would arrange for some kind of a year's program so as to help each grange to undertake such work. A county

contest between the granges was arranged, and the sixteen subordinate granges in the county are each at work on some such project as was presented by the specialist that day. The correspondence following up that one day's visit has continued for six months.

The long-time element, with the necessary follow-up work, may be illustrated by the work in Yates County this year. More than a year ago the extension professor held a recreation school there. A year later, an invitation came asking for a meeting with seven rural-school trustees to help build playground equipment. The seven men spent the afternoon at one of the schools, where poles, pipes, and other materials were collected and a complete playground was constructed. Within a week after that afternoon meeting, one of the trustees had completed his play apparatus and also announced that he had made several improvements over the original designs. The movement grew, until six months later the two rural-school superintendents of the county asked the college specialist to come back and help plan a county-wide program in building school playgrounds. The Pomona Grange was asked to sponsor the project. The fair board at the county seat agreed to construct for use at the county fair a model rural-school playground. Thus the plan developed.

Often, when the extension professor is invited to a community, no one seems to know what is best to undertake. Some group simply announces a meeting and gets a speaker. The task is to study the local needs and to gradually work out a program. Such a meeting in Rensselaer County is an illustration. The home bureau arranged an evening meeting. The specialist arrived in the forenoon and looked over the new little village. At noon he had dinner with two of the home-bureau officers, and he spent two hours of the afternoon with a committee of a dozen persons, discussing the local situation. By the time of the mass meeting in the evening, he had prepared some mimeographed material. Another meeting six weeks later was arranged, and the survey and the meetings were continued. The work resulted in the signing of petitions for incorporating the village, in getting the water tested and beginning the discussion for a water system, in the planning and layout, with the school board, of a playground, in the planning with volunteer firemen for a hall which has since been started, in arranging for the regular weighing and measuring of the school children with the necessary nutrition instruction from the home-bureau agent, and in the organization of a community Sunday School which has since developed into the organization of a church. This community, of course, is not typical, because it is near Albany, has a rapidly growing population, and was just ready, of itself, to make many improvements before the extension worker arrived.

As the project develops it is becoming more apparent that the work of community organization is a very slow process. Much patience is required. On the evening of October 29, 1927, the extension professor was asked to be responsible for a county-wide campaign for establishing a rural traveling library. Exactly seven months later, on the afternoon of May 29, 1928, the president of the county board of supervisors appointed a county library commission of seven to act as the directors of the new library. In the meantime more than thirty meetings in addition

to three county-wide committee meetings had been held, five exhibits had been set up, more than fifty posters had been made by school children and as many essays written, and the supervisors had each been interviewed. The appropriation was voted and the project was a success.

The extension professor has continued the subproject started five years ago, of county-wide training schools in recreational leadership, and this past year has conducted such schools in eight counties. Nine per cent of his time for the year has been given to this subproject. Most of this type of training during the year has been in the field of dramatics.

The year has been marked by the approximation of a goal sought for four years, namely, a state-wide contest in community dramatics. The Little Country Theaters at the various county fairs have demonstrated the use of dramatics contests in stimulating community consciousness and pride. Players have been willing to travel miles, and endure the hardship of performing in a hot, noisy tent, in order that their communities might be represented in the county contest; while other members of these communities have attended the performance with pride, offering the moral support of their community loyalty. Based upon this experience a state-wide contest was arranged, in which, by the process of elimination, four communities could be selected to compete for the state championship during Farm and Home Week in February. The response was gratifying. In the thirteen counties that actually competed, sixty-five communities participated. Each county conducted its own county elimination, either at the county fair or by a specially arranged contest, and then the county winners competed with other county winners of their section of the State in a district contest. The final state contest was between the winners of the various district contests. Not only did the contest arouse interest among the Farm and Home Week visitors, but the large amount of comment heard throughout the State has been exceedingly favorable and the interest in dramatics has been keener than ever. Three new counties have entered the contest for next year, and several of those counties that have not had the dramatics leader-training work are eager to start the project. In addition to the community spirit aroused by the contest, an appreciable improvement of the kind of plays selected for production has been noticed.

The Little Country Theater at the county fairs is gaining strength as a movement. One new Little Theater was started this year and was very successful. There were fifteen Little Theaters at the various fairs last fall.

It is hoped that it may be possible to devote less and less time to the dramatics project as the leaders become stronger and the activity becomes organized through the state contest. Twenty-one leader-training classes were held in 16 counties during the year, with a total enrollment of 510 and a total attendance of 1716. Fifteen of the classes were in elementary work and six in advanced work. The work has been done entirely through the training center, but visits to communities in conjunction with the county training schools are planned for next year.

A large amount of follow-up work is necessary by correspondence, which is becoming increasingly heavy. Problems in the selection of plays, and in alterations of stages as well as buildings to meet the play-production

needs of the community, are most often presented for solution. The loan library has been most important in the work of selection. Under able direction it has been greatly improved in the efficiency of service rendered to constituents. There has been a circulation of 2710 plays and 157 books. These plays are loaned upon request, in lots of six, to be retained for two weeks. This is sufficient time for the selection of a play by the community. The plays are then returned to the library, and the community orders its own copies from the publisher.

A new piece of work this year has been an experiment in a recreational program in 4-H Clubs in two counties. This experiment has been so promising that, at the request of the state leader of junior extension, the assistant extension professor in this department will devote half of her time during the coming year to work with the 4-H Clubs.

Vegetable Gardening

One extension man in the Department of Vegetable Gardening was on sabbatic leave for a half year in 1927-28, and this curtailed the work on home gardening with adults, and the garden and potato work with 4-H Club agents and members. The general program was carried out, but fewer meetings were held.

The growing of vegetables for home consumption on farms, in villages, and in cities is an important phase of agriculture. This department is interested in bringing about a better appreciation and better care of the family garden, especially on the farm. The increase in knowledge concerning the value of vegetables in the diet, and the spread of this knowledge by the State College of Home Economics, have stimulated a marked demand for information on home gardening. The extension activities of the department in this field are carried out by means of meetings, printed information such as bulletins and articles in the daily and weekly press, and personal letters. The subject matter taught largely reinforces that of the nutrition specialists of the State College of Home Economics, giving special attention to those vegetables which are most valuable in the diet. Two phases of gardening are now being stressed; first, a well-planned garden of desirable crops and good varieties; and secondly, instruction on storage of the surplus to aid the housewife in supplying the family with vegetables throughout the year.

A new feature added to the 4-H garden and the 4-H potato club work toward the end of the year 1926-27 was continued through the current year. This consisted of monthly letters on timely topics concerning potatoes and gardening. There were 22 of these letters, 11 on potato topics and 11 on garden topics, sent out during the year, with an average monthly circulation of 1800 to potato-club members and 3000 to garden-club members. These letters have been well received, and the suggestion has been made that a few pertinent questions be included with each letter. Such questions will be included with future letters.

On the commercial side of vegetable gardening, the extension activities of the department consist largely in the dissemination of information along the following lines: the value of good seed; better methods of fertilization; more general use of green manures and cover crops; improved methods of

plant production; better methods of grading and packing vegetable products, including the use of United States grades and standard packages; and economy in the production of vegetables.

The project on better seed involves the procuring of seed of the principal commercial kinds of vegetables grown in New York. The work on this project has been confined to cauliflower, cabbage, potatoes, field beans, onions, lettuce, and canning crops. Soil type, elevation, growing season, and various climatic conditions, enter into the solution of the problem in any given community. In general, the department helps the county agents and the growers to find out what is needed, and then obtains seed of the better strains and varieties for demonstration in the communities. As an illustration, past experience has shown that one strain may be well adapted to one locality but when grown in other districts it may not show up so well. Soil type and certain climatic conditions probably account for this difference in behavior.

One of the major extension projects is that involving the fertility problems of vegetable growers. With the market gardener located near the larger cities, the problem centers around maintaining large yields with a decreased manure supply. In such cases, growers are assisted, either through discussions in meetings or by demonstrations, to include green-manure and cover crops supplemented with commercial fertilizer, or to use fertilizer to supplement what manure they can obtain economically. In the case of muck-land growers, the extension program aims to help them find the best ratio of plant nutrients for the crops they are growing, considering whether the soil is of high-lime or low-lime type. In the past it was common for the growers to use practically one analysis for all crops, whereas at the present time most of them are using the ratio recommended for each particular crop, with the result of better crops and lower costs for fertilizer. During the current season, eight carefully planned fertilizer demonstrations are being conducted by the department in cooperation with the county agents, to show the best type of fertilizer and the optimum rate of application.

The department has given considerable time and attention, during the year, to the problem of better grading and packing of the leading vegetables produced in the State. The rapid expansion of the vegetable industry has brought with it keener competition in the marketing of crops in our larger city markets. Our growers are face to face with the problem of giving more attention to the proper grading and packing, in order to efficiently compete with growers in other sections. The problem is especially important now with the celery growers. The acreage and production of this crop has increased about 25 to 30 per cent, most of this increase occurring in California. This additional acreage is largely an early crop, which moves to our markets during the same time that our late crop is being marketed. In the past season several meetings were held with the celery growers to discuss the problem and help find a solution. The department has decided to carry out a well-planned campaign on better grading and packing during the coming season. Field packing demonstrations will be held in the celery districts, and a large part of the crop will be packed to meet the federal grades and offered for inspection by the state and federal agencies. That which meets the grades will be branded and guaranteed as

to quality. In this way the growers hope, by offering a product of superior quality, to compete successfully with the celery produced elsewhere.

During the year, in addition to its field activities summarized on page 115, members of the department wrote 51 articles of 126 pages, 49 circular letters with a total circulation of 62,114, and 2832 personal letters in answer to inquiries for information.

ACKNOWLEDGMENT

In conclusion, Mr. President, I desire to acknowledge on behalf of my colleagues and myself your unfailing interest, cordial support, and wise counsel in the administration of the State College of Agriculture and the Cornell University Agricultural Experiment Station. These institutions, and the people whom they represent and serve, are under great obligation to you for your able, energetic, and discerning leadership in the work.

Respectfully submitted,

A. R. MANN,

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INDEX

A

PAGE

Activities, new, need of provision for.....	19
Agricultural Economics and Farm Management, extension work.....	128
Agricultural Economics and Farm Management, instruction.....	33
Agricultural Economics and Farm Management, need of building.....	15
Agricultural Economics and Farm Management, research.....	60
Agricultural situation, changes in.....	7
Agronomy, extension work.....	133
Agronomy, instruction	34
Agronomy, research	65
American Dry Milk Institute fellowship.....	21
American Dry Milk Institute investigatorship.....	22
Animal Husbandry, extension work.....	135
Animal Husbandry, research.....	72
Appropriations	10
Armstrong Tree Service, Inc., fellowship.....	22
Assistants, technical and non-technical, need of additional.....	18

B

Behrends, F. G., resignation.....	30
Bentley, John, jr., sabbatic leave.....	41
Binzel, Cora, reappointment.....	30
Botany, extension work.....	139
Botany, instruction	35
Botany, research	75
Boyce-Thompson Institute for Plant Research, joint fellowship..	21
Building needs	14

C

Champlain Valley Fruit Growers' Association fellowship.....	21
Changing agricultural situation.....	7
Charles Lathrop Pack fellowship.....	21
Cooperative Grange League Federation Exchange, Inc., joint investigatorship...	22
Corning Glass Works fellowship.....	21
Coryell, Jay, resignation.....	30
County fairs	116
Crops, field, experimental work needed.....	67

D

Dairy Industry, extension work.....	140
Dairy Industry, instruction.....	36
Dairy Industry, research.....	79
Dairymen's League Cooperative Association, Inc., joint investigatorship.....	22
Dean's report	7
Delinquency in scholarship, modification of rules governing.....	27
Departmental activities	32
Director of the Experiment Station and Research at Ithaca, request for restoration of office	18

E

Educational policies and procedures.....	26
Enrollment of students.....	29
Enrollment, restriction of.....	27
Entomological collections, additions to.....	37

	PAGE
Entomological collections, need of building for.....	14
Entomology and Limnology, extension work.....	143
Entomology and Limnology, instruction.....	36
Entomology and Limnology, research.....	84
Extension schools	114
Extension service	113
Extension specialists' field activities, summary of.....	115

F

Fairs	116
Farm and home institutes	114
Farm and Home Week	117
Farm bureaus	115
Farrand, Livingston, letter of transmittal.....	5
Fellowships	21
Financial statement	11
Fisk, W. W., resignation.....	30
Floriculture and Ornamental Horticulture, extension work.....	145
Floriculture and Ornamental Horticulture, instruction and departmental activities.....	36
Floriculture and Ornamental Horticulture, research.....	89
Forestry, extension work.....	146
Forestry, instruction and departmental activities.....	39
Forestry, research	92

G

Genesee-Orleans Vegetable Growers' Cooperative Association fellowship.....	21
Gibson, A. W., transfer to resident instruction.....	28
Graduate school of tropical agriculture in Porto Rico, proposed.....	28
Graduate study, strengthening of	23
Graves, F. P., letter of transmittal.....	3

H

Ham, L. P., resignation.....	124
Herbarium, additions to.....	35
Honor system, modification of.....	26
Horticultural Society of New York, joint fellowship.....	21
Hoskins, E. R., work in rural education.....	24
Housing situation	14

I

Indian extension	116
Insect collections. <i>See</i> Entomological collections.....	
Instruction, resident	32
International Agricultural Corporation fellowship.....	22
Investigatorships	21

J

Junior extension	122
Junior Field Days.....	118

K

Kennedy, J. D., temporary service.....	41
--	----

L

Labor, miscellaneous, need of additional	18
Land, need of additional	20
Laura Spelman Rockefeller Memorial, special grant.....	22, 108
Library, need of building	15
Long Island vegetable research farm.....	11
Lord, C. S., letter of transmittal.....	3

